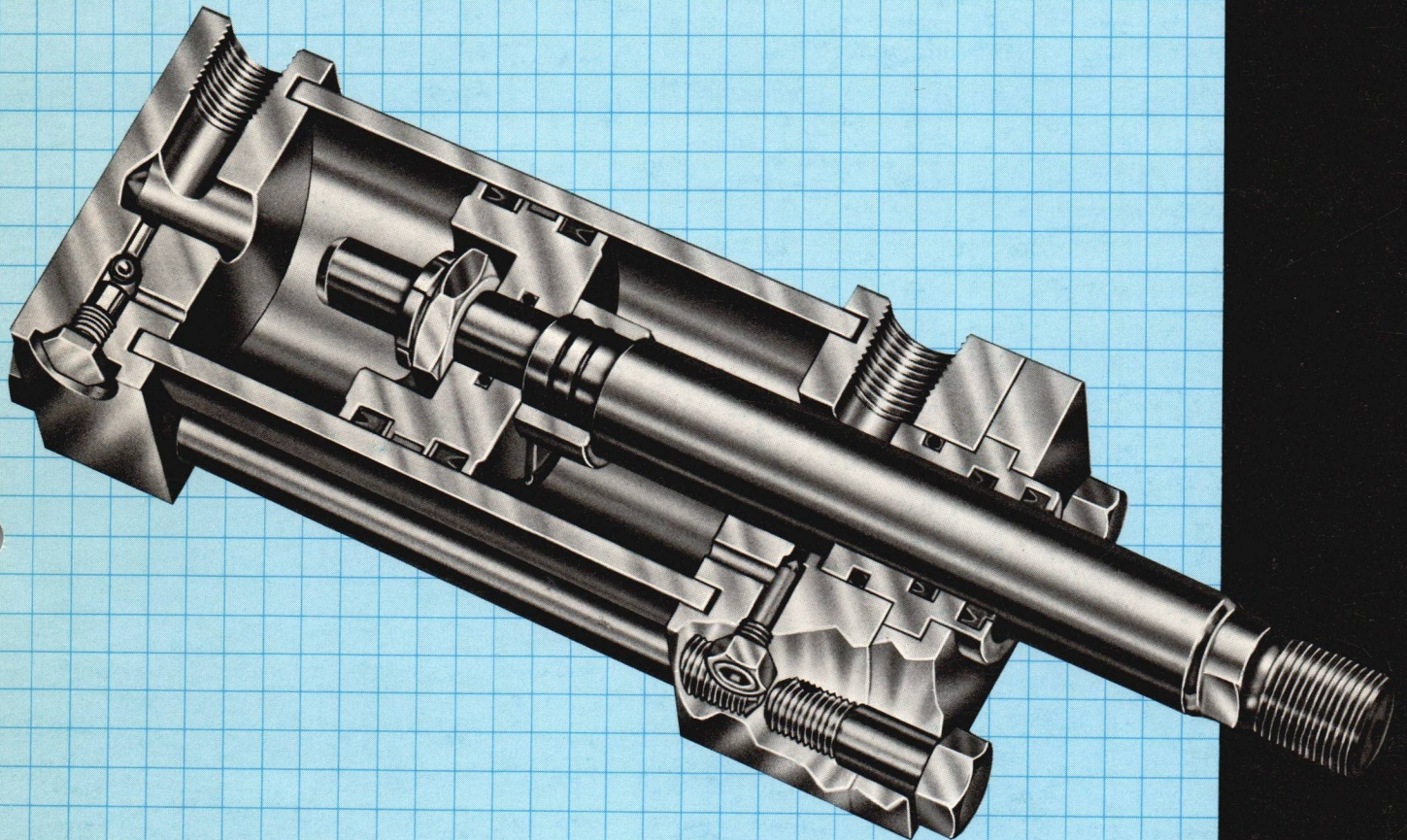


milwaukee
Cylinder
a versa tek company

SERIES A

1½" thru 16" Bore

250 PSI



AIR CYLINDERS *with Removable Retainers*



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**FLUID
POWER**
Association
MEMBER

How to use this catalog . . .

Before selecting a cylinder, take a few moments to read through this catalog. Pay particular attention to the pages concerning design options and rod size selection.

A Complete Index is shown below; page 3 offers a Quick Index. The Complete Index is divided into sections according to subject with a brief description and the associated page number. The Quick Index illustrates the standard available mountings with the number of the page containing dimensional data.

Complete index

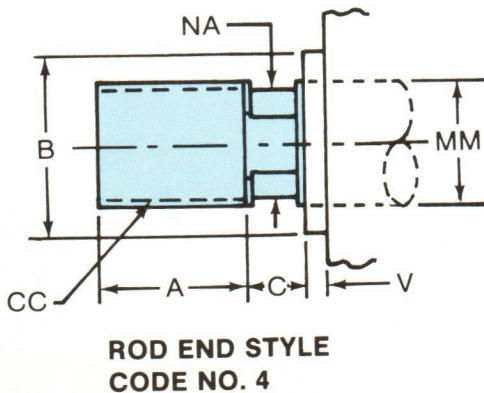
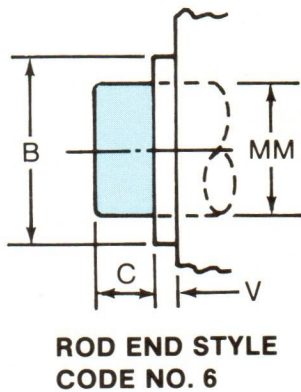
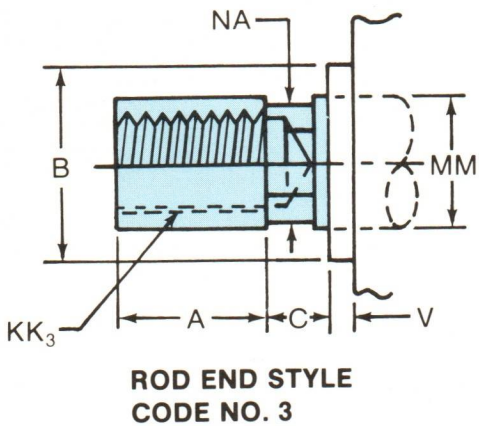
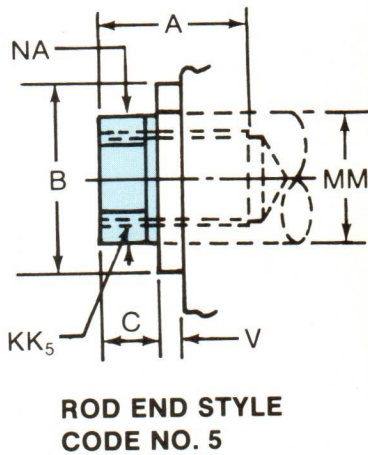
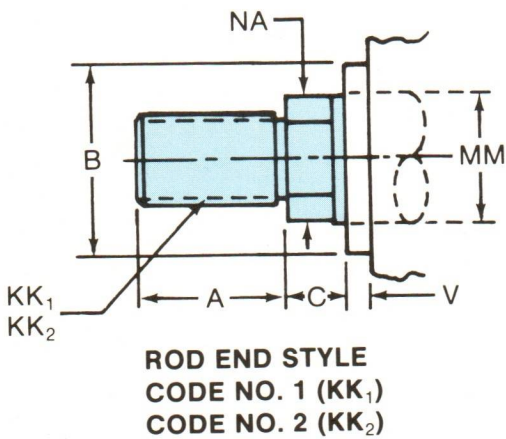
SUBJECT	DESCRIPTION	PAGE
General	QUICK INDEX	3
	DESIGN FEATURES	4
Mounting specifications	PISTON ROD END STYLES	2
	TIE ROD MOUNTS	6
	FLANGE MOUNTS	10
	SIDE AND LUG MOUNTS	14
	PIN AND TRUNNION MOUNTS	18
	DOUBLE ROD END CYLINDERS	22
	LIMIT SWITCH CYLINDERS	23
Accessories	CLEVIS	31
	BRACKETS	31
	PINS	31
	ROD EYES	31
Design options	SPECIAL CYLINDERS	24
	SPECIAL ROD ENDS	24
	SPECIAL ASSEMBLIES FROM STANDARD PARTS ...	24
	COMBINED MOUNTINGS	24
	CUSHION ADJUSTMENT LOCATIONS	24
	PORT LOCATIONS	24
	REMOVABLE TRUNNION PINS	24
	SINGLE ACTING CYLINDERS	24
	SINGLE ACTING SPRING CYLINDERS	24
	WATER SERVICE CYLINDERS	24
	PORTS	25
	STANDARD	25
	OVERSIZE	25
	STRAIGHT THREAD	25
	ROD BOOTS	25
	METALLIC ROD WIPERS	25
	ADJUSTABLE STROKE CYLINDERS	25
Engineering data	STOP TUBE	26
	ROD SIZE SELECTION	27
	HYDRAULIC PRESSURE AND FLOW DATA	27
Installation and maintenance notes	STORAGE	28
	INSTALLATION	28
	MOUNTING RECOMMENDATIONS	28
	CYLINDER TROUBLE SHOOTING	28
	CYLINDER MAINTENANCE	28
Order information	HOW TO ORDER	30
	CYLINDERS	30
	REPLACEMENT PARTS	30
	WARRANTY	30
	CYLINDER ORDER CODE — MODEL NUMBER	31

PISTON ROD
END STYLES

Piston rod end dimensional data

TABLE 3 Piston rod end styles

Caution —
When ordering replacement cylinders for competitive brands our Style No. 1 Rod Ends may not be interchangeable with other cylinder manufacturers Style No. 1. Our Style No. 2 should be used if this applies to your application.

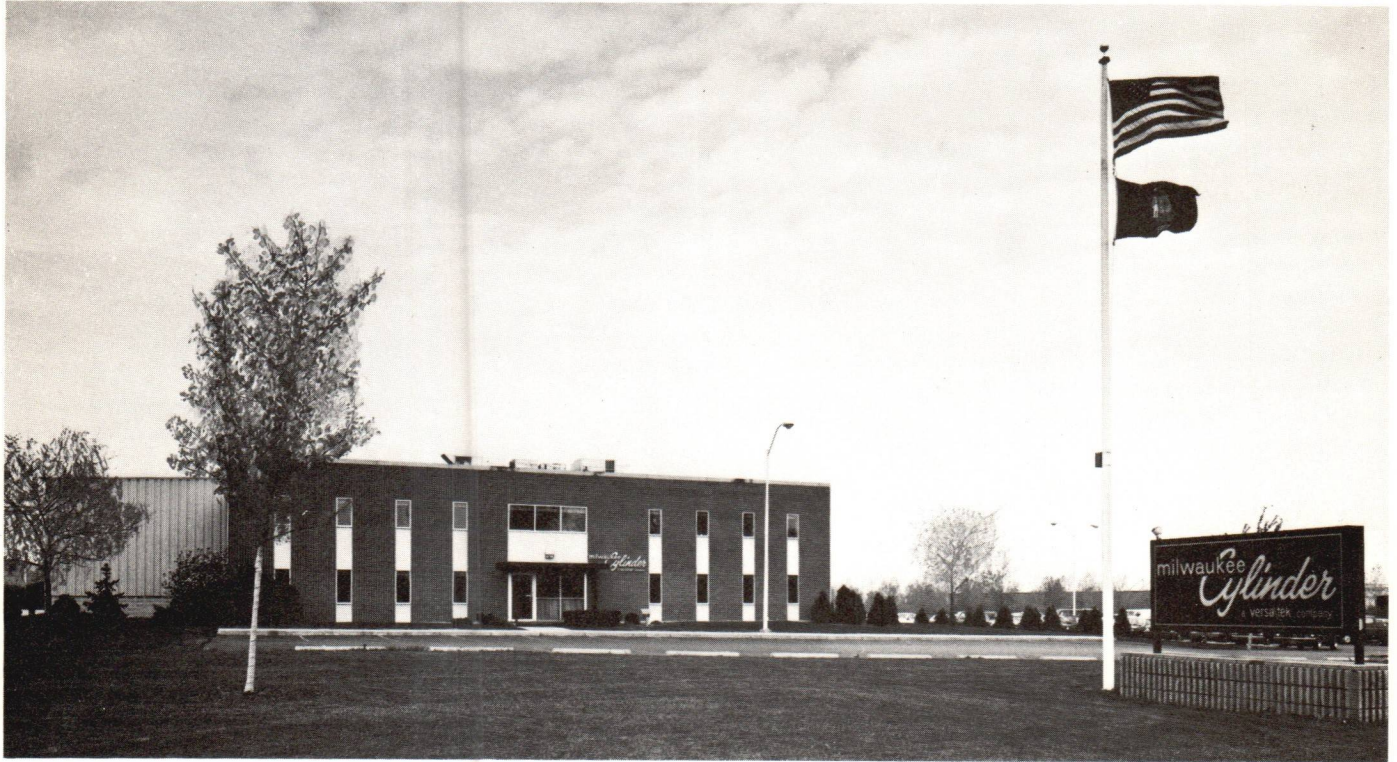


ROD MM	A	B - .001 - .003	C	CC	*D	KK -1-	KK 2-3-5	NA
5/8	3/4	1 1/8	3/8	5/8-18	1/2	1/2-20	7/16-20	19/32
1	1 1/8	1 1/2	1/2	1-14	7/8	7/8-14	3/4-16	31/32
1 3/8	1 5/8	2	5/8	1 3/8-12	1 1/8	1 1/4-12	1-14	1 11/32
1 3/4	2	2 3/8	3/4	1 3/4-12	1 1/2	1 1/2-12	1 1/4-12	1 45/64
2	2 1/4	2 5/8	7/8	2-12	1 11/16	1 3/4-12	1 1/2-12	1 61/64
2 1/2	3	3 3/8	1	2 1/2-12	2 1/16	2 1/4-12	1 7/8-12	2 29/64
3	3 1/2	3 3/4	1	3-12	2 5/8	2 3/4-12	2 1/4-12	2 15/16
3 1/2	3 1/2	4 1/4	1	3 1/2-12	3	3 1/4-12	2 1/2-12	3 1/16
4	4	4 3/4	1	4-12	3 3/8	3 3/4-12	3-12	3 15/16
4 1/2	4 1/2	5 1/4	1	4 1/2-12	3 7/8	4 1/4-12	3 3/4-12	4 27/64
5	5	5 3/4	1	5-12	4 1/4	4 3/4-12	3 1/2-12	4 59/64
5 1/2	5 1/2	6 1/4	1	5 1/2-12	4 5/8	5 1/4-12	4-12	5 27/64

*Distance Across Wrench Flats

When your requirements call for . . .

- proven performance
- expert workmanship
- advanced engineering
- quality materials



ask for Milwaukee . . .

We're proud of our role as a supplier of NFPA Industrial Cylinders to a good selection of some of the outstanding manufacturers in our country. When the cylinder they are buying must have built in performance qualifications they not only turn to us, but keep coming back for more. We've supplied cylinders for use in agriculture irrigation, for food processing equipment, machinery used in automotive and truck manufacturing.

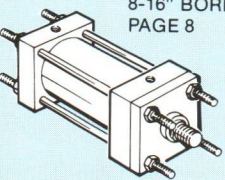
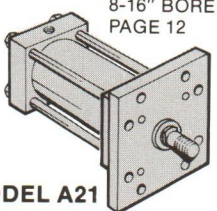
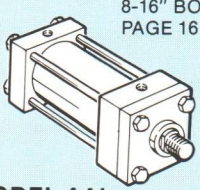
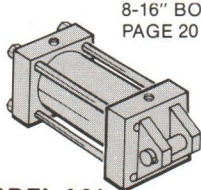
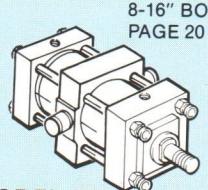
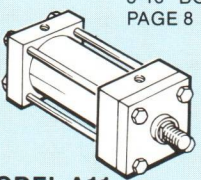
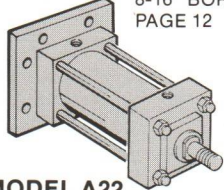
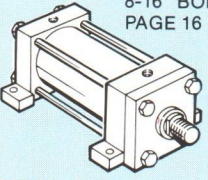
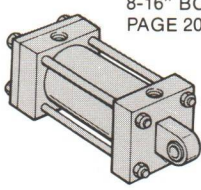
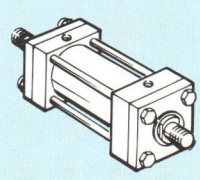
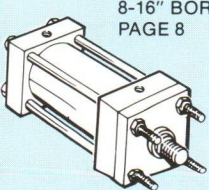
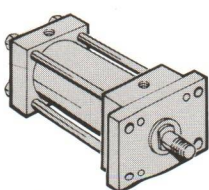
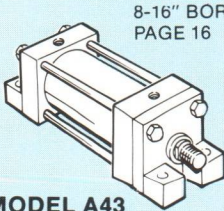
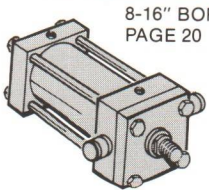
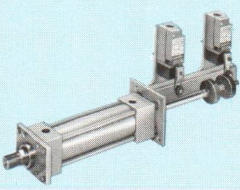
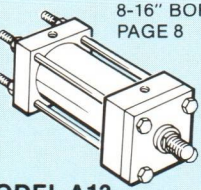
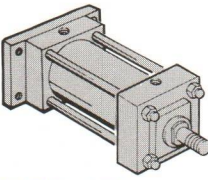
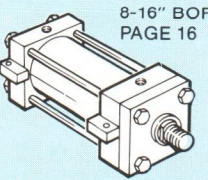
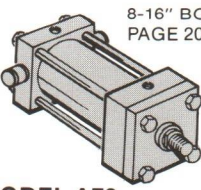
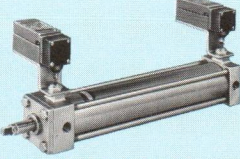
We also supply cylinders for the machine tool industry, testing equipment, and materials handling. At Milwaukee our standard line of cylinders offer an extensive variety for most jobs. If a standard won't fit your bill we're specialists in engineering entirely different cylinders to perform the functions you require. Remember if you take as much pride in your product as we take in ours, we'd like to work with you.

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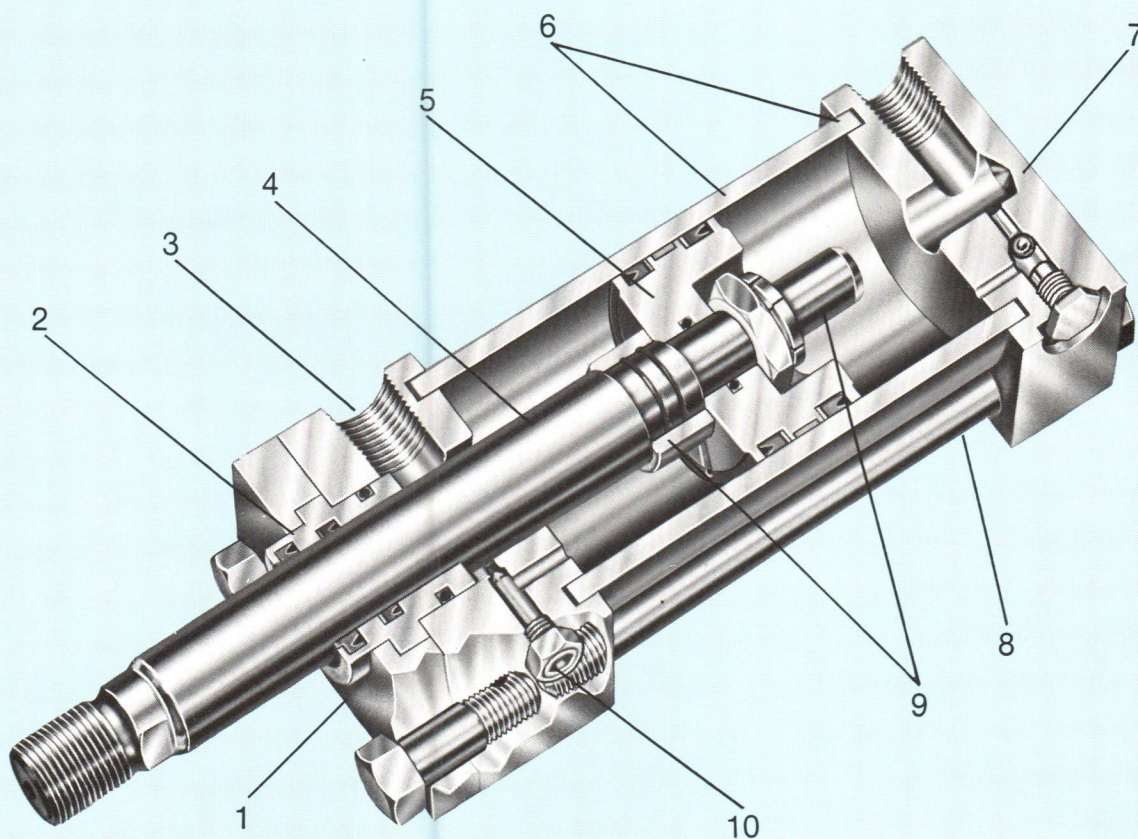
5877 South Pennsylvania Ave. • Cudahy, WI 53110
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Quick index

MILWAUKEE Series "A" air cylinders are built to perform on the toughest applications. Incorporating a variety of Milwaukee's advanced features, proven through the years, these cylinders will provide a long maintenance free service life. Our advanced engineering combined with quality materials and expert workmanship, contribute to the making of a rugged-quality Milwaukee product.

<p>1½-6" BORE PAGE 6 8-16" BORE PAGE 8</p>  <p>MODEL A10 NFPA MX1</p>	<p>1½-6" BORE PAGE 10 8-16" BORE PAGE 12</p>  <p>MODEL A21 NFPA MF5</p>	<p>1½-6" BORE PAGE 14 8-16" BORE PAGE 16</p>  <p>MODEL A41 NFPA MS4</p>	<p>1½-6" BORE PAGE 18 8-16" BORE PAGE 20</p>  <p>MODEL A61 NFPA MP1</p>	<p>1½-6" BORE PAGE 18 8-16" BORE PAGE 20</p>  <p>MODEL A73 NFPA MT4</p>
<p>1½-6" BORE PAGE 6 8-16" BORE PAGE 8</p>  <p>MODEL A11 NFPA MX</p>	<p>1½-6" BORE PAGE 10 8-16" BORE PAGE 12</p>  <p>MODEL A22 NFPA MF6</p>	<p>1½-6" BORE PAGE 14 8-16" BORE PAGE 16</p>  <p>MODEL A42 NFPA MS2</p>	<p>1½-6" BORE PAGE 18 8-16" BORE PAGE 20</p>  <p>MODEL A62</p>	<p>1½-16" BORE PAGE 22</p>  <p>DOUBLE ROD END NFPA MDX</p>
<p>1½-6" BORE PAGE 6 8-16" BORE PAGE 8</p>  <p>MODEL A12 NFPA MX3</p>	<p>1½-6" BORE PAGE 10</p>  <p>MODEL A31 NFPA MF1</p>	<p>1½-6" BORE PAGE 14 8-16" BORE PAGE 16</p>  <p>MODEL A43 NFPA MS7</p>	<p>1½-6" BORE PAGE 18 8-16" BORE PAGE 20</p>  <p>MODEL A71 NFPA MT1</p>	<p>PAGE 23</p>  <p>TAIL ROD LIMIT SWITCH CYLINDER</p>
<p>1½-6" BORE PAGE 6 8-16" BORE PAGE 8</p>  <p>MODEL A13 NFPA MX2</p>	<p>1½-6" BORE PAGE 10</p>  <p>MODEL A32 NFPA MF2</p>	<p>1½-6" BORE PAGE 14 8-16" BORE PAGE 16</p>  <p>MODEL A51 NFPA MS3</p>	<p>1½-6" BORE PAGE 18 8-16" BORE PAGE 20</p>  <p>MODEL A72 NFPA MT2</p>	<p>PAGE 23</p>  <p>END OF STROKE LIMIT SWITCH CYLINDER</p>

Standard specifications and features



Standard Specifications

- **STANDARD CONSTRUCTION—**
SQUARE HEAD-TIE ROD DESIGN
- **NOMINAL PRESSURE—**
250 PSI AIR SERVICE
- **STANDARD FLUID—**FILTERED AIR
- **STANDARD TEMPERATURE—**
-20 F TO +250 F
- **STANDARD BORE SIZES—**
1-1/2" THRU 16"
- **STANDARD PISTON ROD DIAMETERS—**
5/8" THRU 5-1/2"
- **STANDARD MOUNTING STYLES—**
EIGHTEEN STANDARD STYLES PLUS
CUSTOM DESIGNS TO SUIT YOUR NEEDS
- **STROKES—**AVAILABLE IN ANY STROKE
LENGTH UP TO 240"
- **CUSHIONS—**AVAILABLE AT EITHER OR
BOTH ENDS OF STROKE
- **STANDARD SIX ROD END STYLES PLUS**
SPECIALS DESIGNED TO ORDER

Standard Features

1. Removable Retainer Plate

The retainer plate and rod bushing are externally removable. On most models total disassembly of the cylinder is not necessary. Four self locking capscrews hold the retainer plate in place.

2. Rod Bushing and Seals

The rod bushing is accurately machined from solid bearing bronze. It is piloted and retained in the end cap to provide positive rod support and designed for maximum bearing area.

Buna seals are supplied as standard with the Milwaukee Series "A" cylinder. They are suitable for use with air or petroleum base fluids up to a temperature of 250° F. For high temperature or synthetic petroleum base fluids, seals of Butyl, Viton, and Teflon are available at extra charge.

3. Ports

Large NPTF cylinder ports are provided. They can be rotated to any 90 degree position in relation to each other and the mounting.

4. Piston Rod

The piston rod is of high strength steel. It is hardened and plated to resist scoring and corrosion to assure maximum seal life.

5. Piston

A lightweight, low inertia, non-corrosive piston is precision machined from high strength aluminum alloy. The piston is pilot fitted and locked to the rod with a staked nut.

6. Cylinder Barrel

The barrel is honed and hard chrome plated. This provides superior sealing power, with the minimum of friction, to assure long seal life.

7. End Caps

The end caps and mountings are of high quality steel precision machined for accurate mounting.

8. Tie Rods

The tie rods are constructed from a high quality medium carbon steel. The threads are accurately machined for rigid engagement of the nuts.

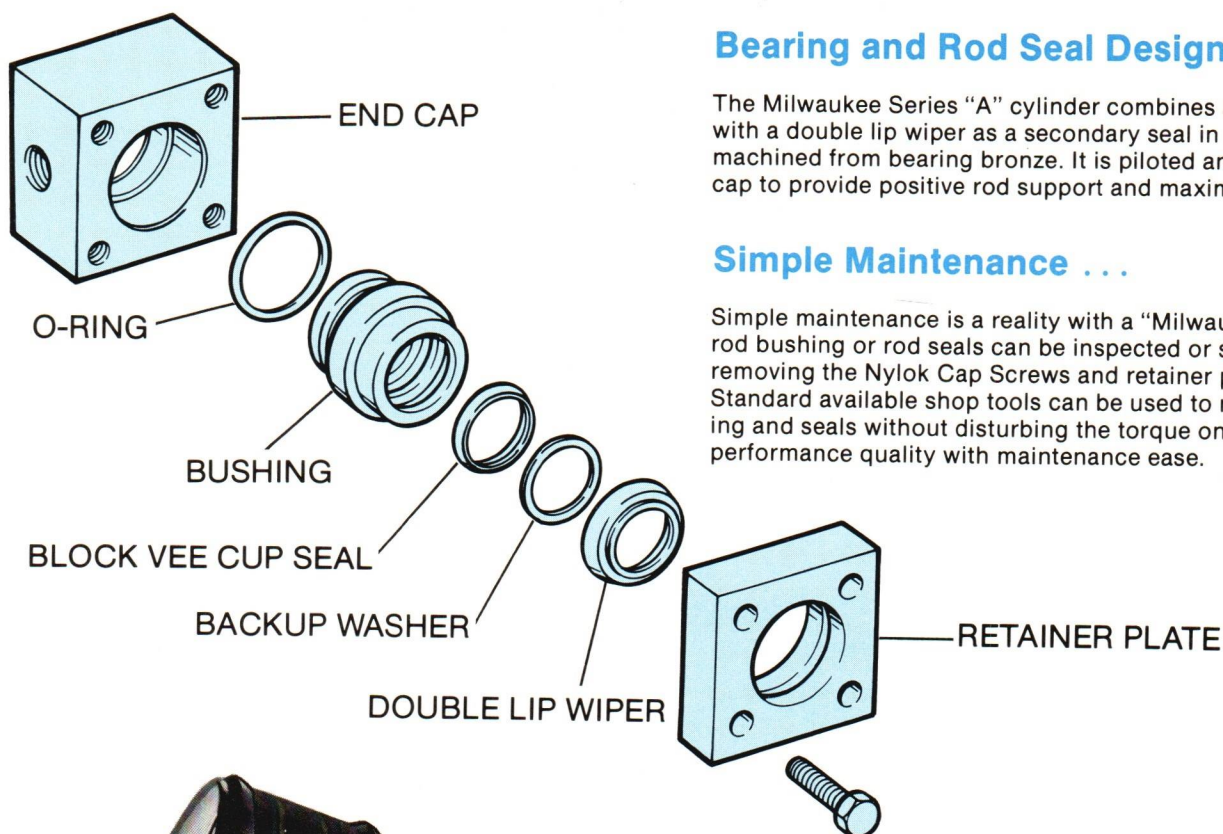
9. Cushions

The cushions are machined to close tolerance to provide positive, smooth deceleration at the end of stroke.

10. Cushion Needle Adjustment and Ball Check

The cushion adjustment valve and cushion check ball retainer screw are specially designed to provide full cushion adjustment and sealed with a teflon ring to prevent leakage.

Performance tested design features

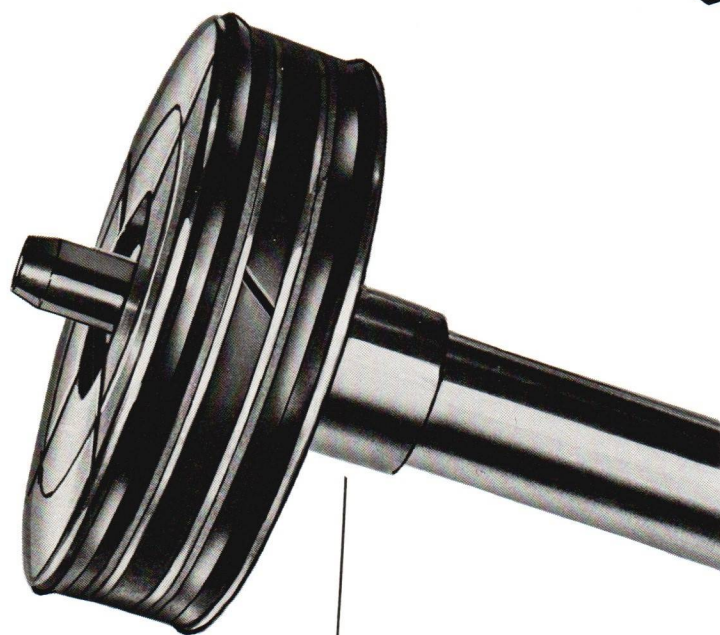


Bearing and Rod Seal Design . . .

The Milwaukee Series "A" cylinder combines a block vee cup seal with a double lip wiper as a secondary seal in a solid rod bushing machined from bearing bronze. It is piloted and retained in the end cap to provide positive rod support and maximum bearing area.

Simple Maintenance . . .

Simple maintenance is a reality with a "Milwaukee" cylinder. The rod bushing or rod seals can be inspected or serviced by merely removing the Nylok Cap Screws and retainer plate on most models. Standard available shop tools can be used to remove the rod bushing and seals without disturbing the torque on the tie rods assuring performance quality with maintenance ease.



Piston and Seal Combination . . .

The Milwaukee Series "A" cylinder combines a non-scoring wear ring, with two block vee seals and a high strength aluminum alloy piston. This proven design combines low friction and smooth break away with the near zero leakage of the block vee seal.

Cushions . . .

The cushion is of a high grade alloy, precision machined and specially tapered to provide smooth deceleration of the piston at the end of stroke. The rod end cushion bushing is floated on two O-rings to compensate for minor misalignments during normal operation. This is to assure that our customers receive the total quality of performance that is designed into a Milwaukee Cylinder.

Piston Rod . . .

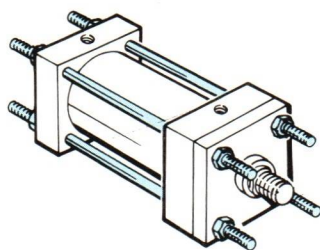
The piston rod is hardened, plated high strength steel, machined and processed to resist scoring and corrosion assuring maximum life. Milwaukee offers six rod end styles as standard. The style #1 rod end with two wrench flats is furnished as standard unless the customer specifies another style. Special rod ends and extra wrench flats are available at a slightly extra charge. They must be specified at the time of order giving the dimensional requirements and the location of additional wrench flats.

TIE-ROD MOUNT

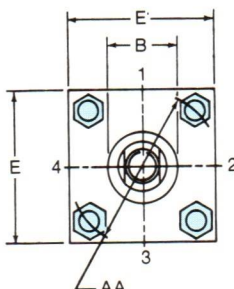
The flange and tie-rod mounts are basically the same except that the cylinder tie rods are extended and used to mount the cylinder. To prevent misalignment, sagging, or possible binding of the cylinder, when long strokes are required, the free end should be supported. The best use of tie-rods when extended on the

blind end is in a thrust load application. When using tie-rods extended on the rod end, the best application is a tension load. Tie-rod mounts are suited for many applications, but it should be noted that they are not as rigid as the flange type of mounting.

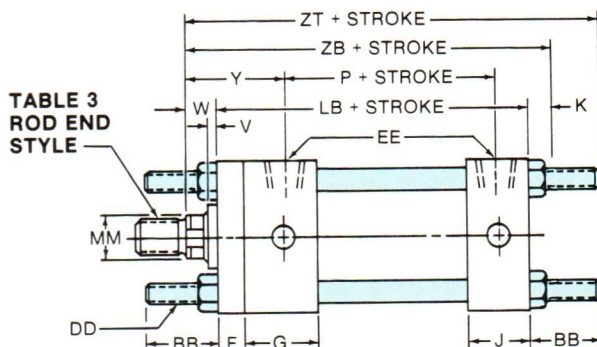
FOR PACKAGE AND MOUNTING DIMENSIONS SEE TABLES 1 AND 2



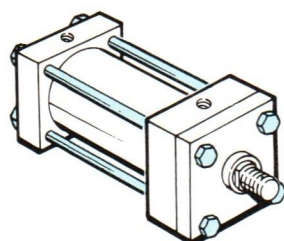
**MODEL A10
NFPA STYLE MX1**



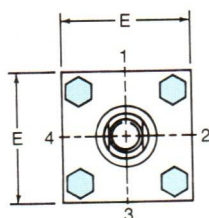
TIE-RODS EXTENDED BOTH ENDS



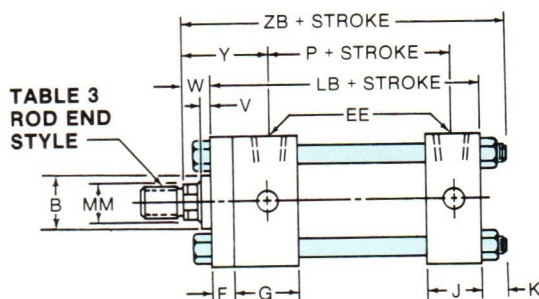
**TABLE 3
ROD END
STYLE**



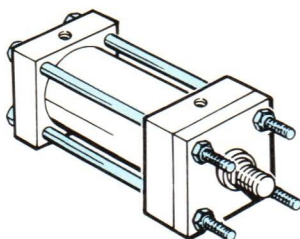
**MODEL A11
NFPA STYLE MX**



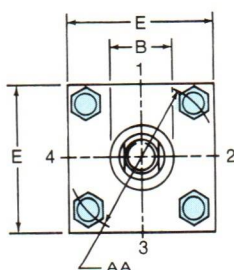
NO TIE-ROD EXTENSION



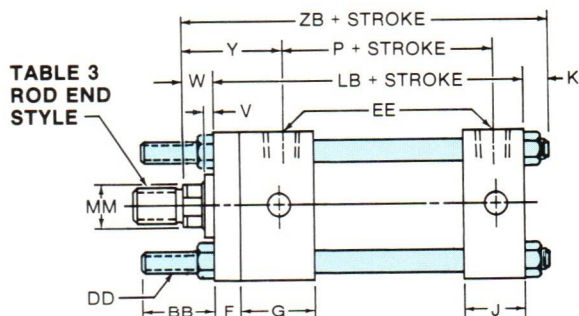
**TABLE 3
ROD END
STYLE**



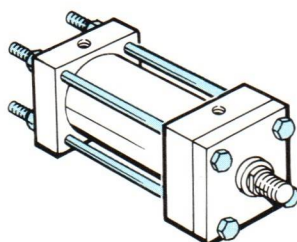
**MODEL A12
NFPA STYLE MX3**



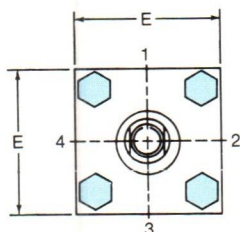
TIE-RODS EXTENDED ROD END



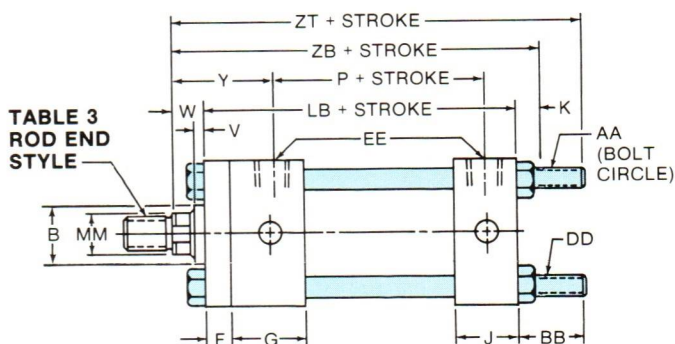
**TABLE 3
ROD END
STYLE**



**MODEL A13
NFPA STYLE MX2**



TIE-RODS EXTENDED BLIND END



**TABLE 3
ROD END
STYLE**

Dimensional data

(1½"-6" BORE)

TABLE 1 The dimensions given on this table are affected by the piston rod diameter and the stroke.

BORE DIA.	ROD MM	CYLINDER CODE #	B	LB	P	V	W	Y	ZB	ZT
1½	5/8	11	1⅞	4	2¼	¼	5/8	1⅝/16	4⅞	5⅝
	•1	12	1½			½	1	2⅝/16	5¼	6
2	5/8	110	1⅞	4	2¼	¼	5/8	1⅝/16	4⅝/16	5¾
	1	111	1½			½	1	2⅝/16	5⅝/16	6⅞
	•1⅜	112	2			5/8	1¼	2⅞/16	5⅞/16	6⅜
2½	5/8	120	1⅞	4⅞	2⅜	¼	5/8	1⅝/16	5⅝/16	5⅞
	1	121	1½			½	1	2⅝/16	5⅞/16	6¼
	1⅜	122	2			5/8	1¼	2⅞/16	5⅝/16	6½
	•1¾	123	2⅜			¾	1½	2⅝/16	5⅝/16	6¾
3¼	1	130	1½	4⅞	2⅝	¼	¾	2⅞/16	6	7
	1⅜	131	2			¾	1	2⅝/16	6¼	7¼
	1¾	132	2⅜			½	1¼	2⅝/16	6½	7½
	2	133	2⅝			½	1⅜	3⅝/16	6⅝	7⅝
4	1	140	1½	4⅞	2⅝	¼	¾	2⅞/16	6	7
	1⅜	141	2			¾	1	2⅝/16	6¼	7¼
	1¾	142	2⅜			½	1¼	2⅝/16	6½	7½
	2	143	2⅝			½	1⅜	3⅝/16	6⅝	7⅝
	2½	144	3⅞			5/8	1⅝	3⅝/16	6⅞	7⅞
5	1	1x50	1½	5⅞	2⅞	¼	¾	2⅞/16	6⅝/16	7⅝/16
	1⅜	1x51	2			¾	1	2⅝/16	6⅞/16	7⅝/16
	1¾	1x52	2⅜			½	1¼	2⅝/16	6⅝/16	8⅝/16
	2	153	2⅝			½	1⅜	3⅝/16	6⅝/16	8⅝/16
	2½	154	3⅞			5/8	1⅝	3⅝/16	7⅝/16	8⅞/16
	3	155	3¾			5/8	1⅝	3⅝/16	7⅝/16	8⅞/16
	3½	156	4¼			5/8	1⅝	3⅝/16	7⅝/16	8⅞/16
6	1⅜	160	2	5¾	3⅞	¼	7/8	2⅝/16	7⅝/16	8⅞/16
	1¾	161	2⅜			¾	1⅞	3⅝/16	7⅝/16	8⅝/16
	2	162	2⅝			¾	1¼	3⅝/16	7⅝/16	8⅝/16
	2½	163	3⅞			½	1½	3⅝/16	7⅝/16	9⅝/16
	3	164	3¾			½	1½	3⅝/16	7⅝/16	9⅝/16
	3½	165	4¼			½	1½	3⅝/16	7⅝/16	9⅝/16
	4	166	4¾			½	1½	3⅝/16	7⅝/16	9⅝/16

HOW TO ORDER

For ordering information refer to Page 30.

NOTES:

#For double rod end cylinders the cylinder code number is to be written with the letter D. (Refer to page 22.)

•Available with fixed-nonadjustable cushions on rod end and standard adjustable cushions on the blind end only.

CUSHIONS:

The longest cushion is provided that can be accommodated by the rod and blind end caps in any given bore size. Longer cushions are available; for further information consult the factory.

PORTS:

Series A cylinders are supplied with NPTF tapered pipe threads as standard. The largest size port is provided that can be accommodated by the rod and blind end caps in any given bore size. For further information on different types of ports or oversized ports refer to page 25.

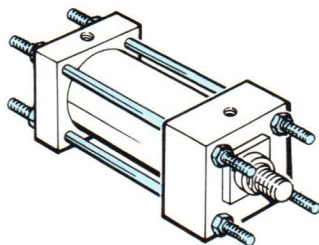
TABLE 2 These dimensions are constant regardless of rod diameter or stroke.

BORE DIA.	AA	BB	DD	E	EE	F	G	J	K
1½	2.02	1	¼-28	2	¾	¾	1½	1	¼
2	2.60	1⅞	5/16-24	2½	¾	¾	1½	1	5/16
2½	3.10	1⅞	5/16-24	3	¾	¾	1½	1	5/16
3¼	3.90	1⅜	¾-24	3¾	½	5/8	1¾	1¼	¾
4	4.70	1⅜	¾-24	4½	½	5/8	1¾	1¼	¾
5	5.80	1⅝/16	½-20	5½	½	5/8	1¾	1¼	7/16
6	6.90	1⅝/16	½-20	6½	¾	¾	2	1½	7/16

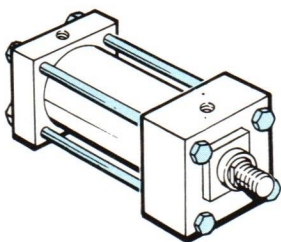
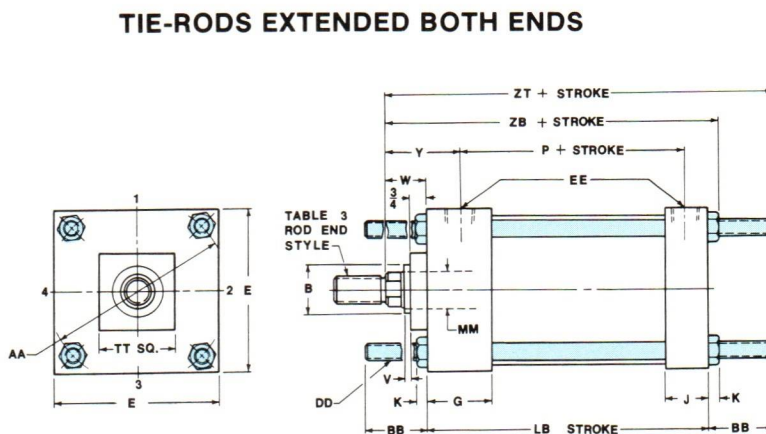
**SEE TABLE 3
PAGE 2 FOR
ROD END STYLES
AND DIMENSIONS**

TIE-ROD MOUNT

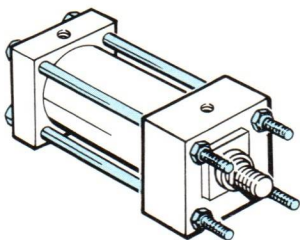
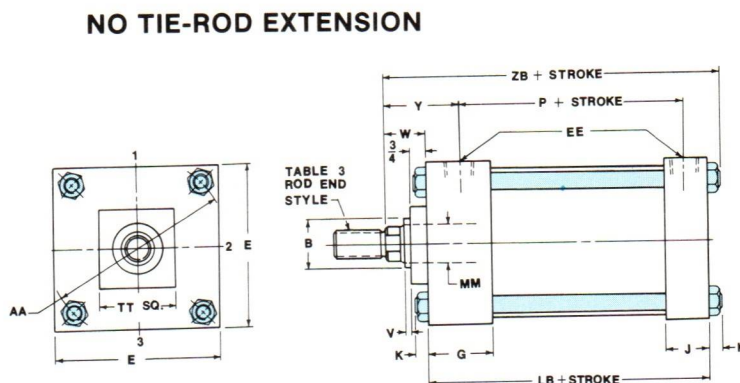
FOR PACKAGE AND MOUNTING DIMENSIONS SEE TABLES 1 AND 2



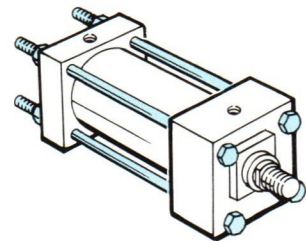
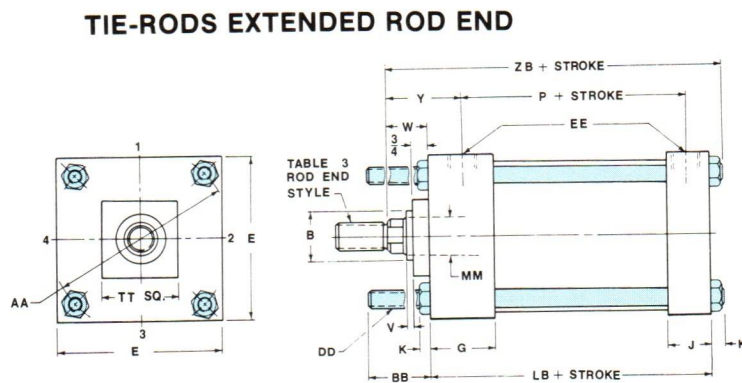
MODEL A10
NFPA STYLE MX1



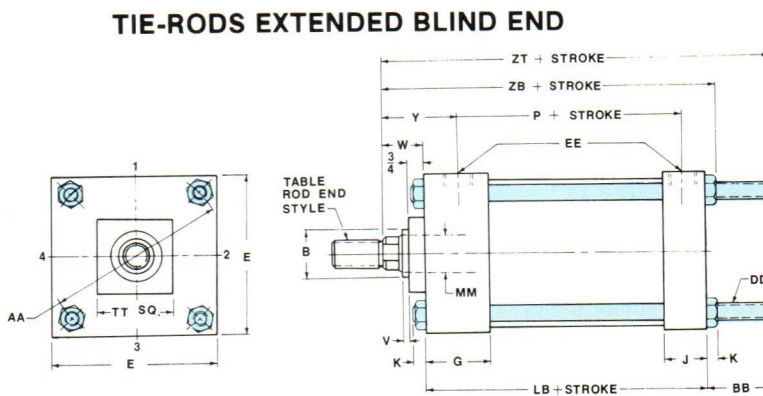
MODEL A11
NFPA STYLE MX



MODEL A12
NFPA STYLE MX3



MODEL A13
NFPA STYLE MX2



Dimensional data

(8"-16" BORE)

TABLE 1 The dimensions given on this table are affected by the piston rod diameter and the stroke.

BORE DIA.	ROD MM	CYLINDER CODE #	B	LB	P	TT	V	W	Y	ZB	ZT
8	1 3/8	180	2	5 1/8	3 1/4	4	1/4	1 5/8	2 13/16	7 5/16	9 1/16
	1 3/4	181	2 3/8			4	3/8	1 7/8	3 1/16	7 9/16	9 5/16
	2	182	2 5/8			4	3/8	2	3 3/16	7 11/16	9 7/16
	2 1/2	183	3 1/8			4	1/2	2 1/4	3 7/16	7 15/16	9 11/16
	3	184	3 3/4			5 1/2					
	3 1/2	185	4 1/4			5 1/2					
	4	186	4 3/4			5 1/2					
	4 1/2	187	5 1/4			7					
	5	188	5 3/4			7					
	5 1/2	189	6 1/4			7					
10	1 3/4	1100	2 3/8	6 3/8	4 1/8	4	3/8	1 7/8	3 1/8	8 15/16	10 15/16
	2	1101	2 5/8			4	3/8	2	3 1/4	9 1/16	11 1/16
	2 1/2	1102	3 1/8			4	1/2	2 1/4	3 1/2	9 5/16	11 5/16
	3	1103	3 3/4			5 1/2					
	3 1/2	1104	4 1/4			5 1/2					
	4	1105	4 3/4			5 1/2					
	4 1/2	1106	5 1/4			7					
	5	1107	5 3/4			7					
12	5 1/2	1108	6 1/4			7					
	2	1120	2 5/8	6 7/8	4 5/8	4	3/8	2	3 1/4	9 9/16	11 9/16
	2 1/2	1121	3 1/8			4	1/2	2 1/4	3 1/2	9 13/16	11 13/16
	3	1122	3 3/4			5 1/2					
	3 1/2	1123	4 1/4			5 1/2					
	4	1124	4 3/4			5 1/2					
	4 1/2	1125	5 1/4			7					
14	5	1126	5 3/4			7					
	5 1/2	1127	6 1/4			7					
	2 1/2	1140	3 1/8	8 1/8	5 1/2	4	1/2	2 1/4	3 13/16	11 3/16	13 9/16
	3	1141	3 3/4			5 1/2					
	3 1/2	1142	4 1/4			5 1/2					
	4	1143	4 3/4			5 1/2					
	4 1/2	1144	5 1/4			7					
	5	1145	5 3/4			7					
16	5 1/2	1146	6 1/4			7					
	2 1/2	1160	3 1/8	8 1/8	5 5/8	4	1/2	2 1/4	3 3/4	11 3/16	13 9/16
	3	1161	3 3/4			5 1/2					
	3 1/2	1162	4 1/4			5 1/2					
	4	1163	4 3/4			5 1/2					
	4 1/2	1164	5 1/4			7					
	5	1165	5 3/4			7					
	5 1/2	1166	6 1/4			7					

HOW TO ORDER

For ordering information refer to Page 30.

NOTES:

#For double rod end cylinders the cylinder code number is to be written with the letter D. (Refer to page 22.)

CUSHIONS:

The longest cushion is provided that can be accommodated by the rod and blind end caps in any given bore size. Longer cushions are available; for further information consult the factory.

PORTS:

Series A cylinders are supplied with NPTF tapered pipe threads as standard. The largest size port is provided that can be accommodated by the rod and blind end caps in any given bore size. For further information on different types of ports or oversized ports refer to page 25.

**SEE TABLE 3
PAGE 2 FOR
ROD END STYLES
AND DIMENSIONS**

TABLE 2 These dimensions are constant regardless of rod diameter or stroke.

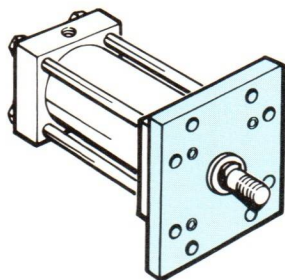
BORE DIA.	AA	BB	DD	E	EE	G	J	K
8	9.10	2 5/16	5/8-18	8 1/2	3/4	2	1 1/2	9/16
10	11.2	2 11/16	3/4-16	10 5/8	1	2 1/4	2	1 1/16
12	13.3	2 11/16	3/4-16	12 3/4	1	2 1/4	2	1 1/16
14	15.4	3 3/16	7/8-14	14 3/4	1 1/4	2 3/4	2 1/4	1 3/16
16	17.9	3 3/16	7/8-14	17	1 1/4	2 3/4	2 1/4	1 3/16

FLANGE MOUNT

The flange mount is one of the strongest most rigid methods of mounting. With this type of mount there is little allowance for misalignment, though when long strokes are required the free end opposite should be supported to prevent sagging and possible binding of the cylinder. The best use of a blind

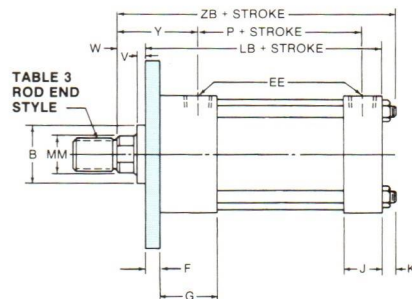
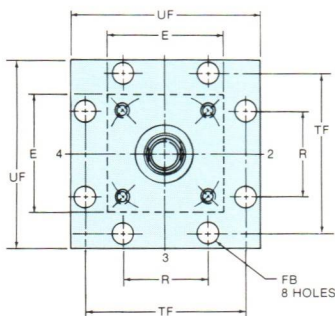
end flange is in a thrust load application (rod in compression). Rod end flange mounts are best used in tension applications. When a less rigid mount can be used and the cylinder can be attached to a panel or bulkhead an extended tie rod mounting could be considered.

FOR PACKAGE AND MOUNTING DIMENSIONS SEE TABLES 1 AND 2

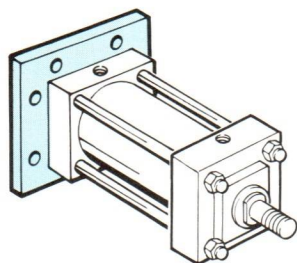


**MODEL A21
NFPA STYLE MF5**

ROD SQUARE FLANGE MOUNTING

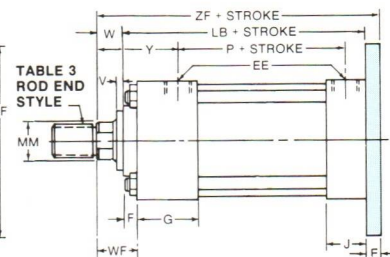
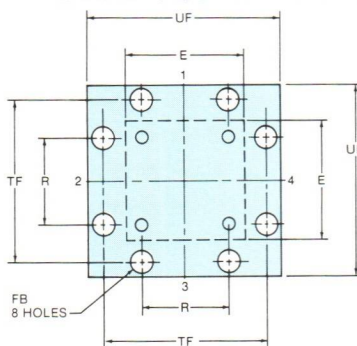


**TABLE 3
ROD END
STYLE**

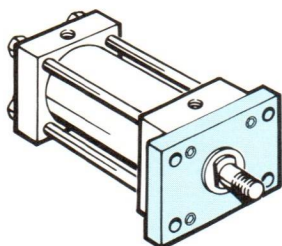


**MODEL A22*
NFPA STYLE MF6**

BLIND SQUARE FLANGE MOUNTING

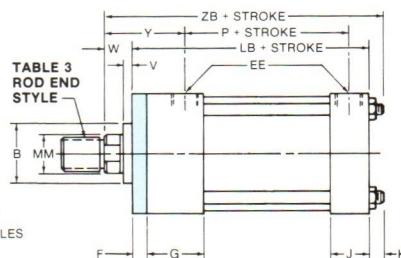
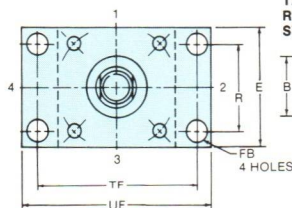


**TABLE 3
ROD END
STYLE**

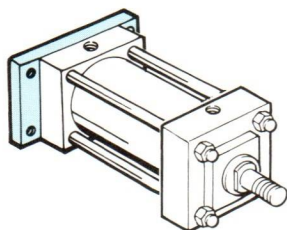


**MODEL A31
NFPA STYLE MF1**

ROD RECTANGULAR FLANGE MOUNTING

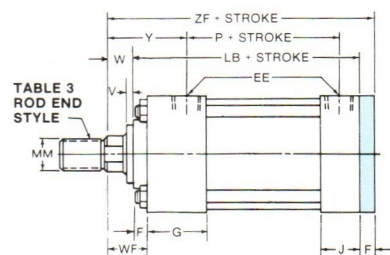
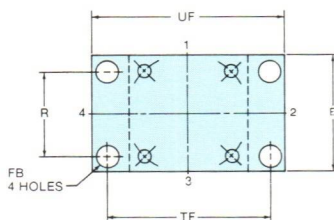


**TABLE 3
ROD END
STYLE**



**MODEL A32*
NFPA STYLE MF2**

BLIND RECTANGULAR FLANGE MOUNTING



**TABLE 3
ROD END
STYLE**

Dimensional data (1½"-6" BORE)

TABLE 1 The dimensions given on this table are affected by the piston rod diameter and the stroke.

BORE DIA.	ROD MM	CYLINDER CODE #	B	LB	P	V	W	WF	Y	ZB	ZF
1½	5/8	11	1⅛	4	2¼	¼	5/8		1⅝ ₁₆	4⅞	5
	•1 *	12	1½			½	1		2⅝ ₁₆	5¼	5⅜
2	5/8	110	1⅛	4	2¼	¼	5/8		1⅝ ₁₆	4⅝ ₁₆	5
	1	111	1½			½	1		2⅝ ₁₆	5⅝ ₁₆	5⅜
	•1⅜ *	112	2			5/8	1¼		2⅞ ₁₆	5⅞ ₁₆	5⅝
2½	5/8	120	1⅛	4⅞	2⅜	¼	5/8		1⅝ ₁₆	5⅝ ₁₆	5⅝
	1	121	1½			½	1		2⅝ ₁₆	5⅞ ₁₆	5½
	1⅜	122	2			5/8	1¼		2⅞ ₁₆	5⅞ ₁₆	5¾
	•1¾ *	123	2⅜			¾	1½		2⅞ ₁₆	5⅞ ₁₆	6
3¼	1	130	1½	4⅞	2⅝	¼	¾		2⅞ ₁₆	6	6¼
	1⅜	131	2			3/8	1	1⅝	2⅞ ₁₆	6¼	6½
	1¾	132	2⅜			½	1¼	1⅞	2⅝ ₁₆	6½	6¾
	2 *	133	2⅝			½	1⅜	2	3⅞ ₁₆	6⅝	6⅞
4	1	140	1½	4⅞	2⅝	¼	¾		2⅞ ₁₆	6	6¼
	1⅜	141	2			3/8	1		2⅞ ₁₆	6¼	6½
	1¾	142	2⅜			½	1¼	1⅞	2⅝ ₁₆	6½	6¾
	2	143	2⅝			½	1⅜	2	3⅞ ₁₆	6⅝	6⅞
	2½ *	144	3⅛			5/8	1⅝	2¼	3⅝ ₁₆	6⅞	7⅛
5	1	1x50	1½	5⅞	2⅞	¼	¾		2⅞ ₁₆	6⅝ ₁₆	6½
	1⅜	1x51	2			3/8	1		2⅞ ₁₆	6⅞ ₁₆	6¾
	1¾	1x52	2⅜			½	1¼		2⅝ ₁₆	6⅞ ₁₆	7
	2	153	2⅝			½	1⅜	2	3⅞ ₁₆	6⅝ ₁₆	7⅛
	2½	154	3⅛			5/8	1⅝	2¼	3⅝ ₁₆	7⅝ ₁₆	7⅜
	3	155	3¾			5/8	1⅝	2¼	3⅝ ₁₆	7⅝ ₁₆	7⅜
6	3½ *	156	4¼	5¾	3⅞	5/8	1⅝	2¼	3⅝ ₁₆	7⅝ ₁₆	7⅜
	1⅜	160	2			¼	7/8		2⅞ ₁₆	7⅝ ₁₆	7⅜
	1¾	161	2⅜			3/8	1⅞		3⅞ ₁₆	7⅝ ₁₆	7⅝
	2	162	2⅝			3/8	1¼		3⅞ ₁₆	7⅞ ₁₆	7¾
	2½	163	3⅛			½	1½	2¼	3⅞ ₁₆	7⅞ ₁₆	8
	3	164	3¾			½	1½	2¼	3⅞ ₁₆	7⅞ ₁₆	8
	3½	165	4¼			½	1½	2¼	3⅞ ₁₆	7⅞ ₁₆	8
	4	166	4¾			½	1½	2¼	3⅞ ₁₆	7⅞ ₁₆	8

HOW TO ORDER

For ordering information refer to Page 30.

NOTES:

#For double rod end cylinders the cylinder code number is to be written with the letter D. (Refer to page 22.)

•Available with fixed-nonadjustable cushions on rod end and standard adjustable cushions on the blind end only.

*Removable retainer not available for these bore and rod combinations in the A22 and A32 mounting styles.

PORTS:

Series A cylinders are supplied with NPTF tapered pipe threads as standard. The largest size port is provided that can be accommodated by the rod and blind end caps in any given bore size. For further information on different types of ports or oversized ports refer to page 25.

CUSHIONS:

The longest cushion is provided that can be accommodated by the rod and blind end caps in any given bore size. Longer cushions are available; for further information consult the factory.

TABLE 2 These dimensions are constant regardless of rod diameter or stroke.

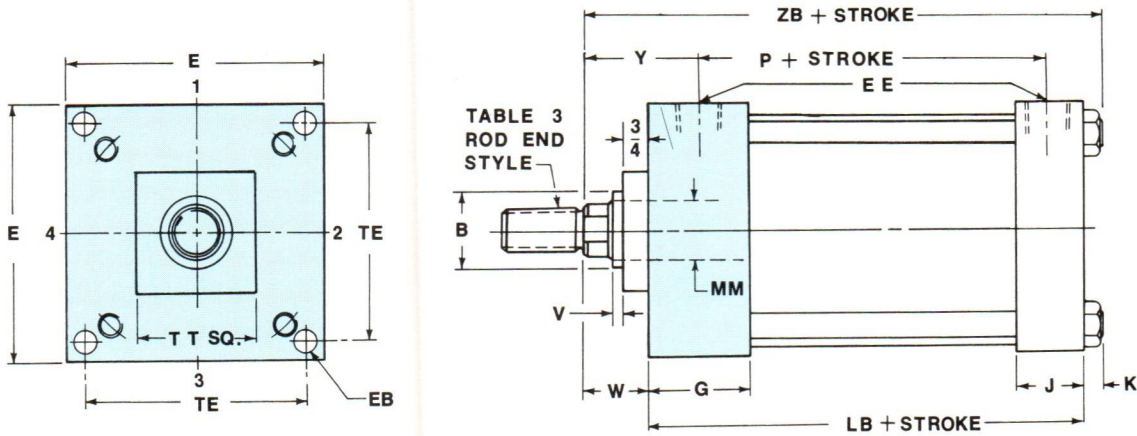
BORE DIA.	E	EE	F	FB	G	J	K	R	TF	UF
1½	2	3/8	3/8	5/16	1½	1	¼	1.43	2¾	3⅜
2	2½	3/8	3/8	3/8	1½	1	5/16	1.84	3⅜	4⅞
2½	3	3/8	3/8	3/8	1½	1	5/16	2.19	3⅞	4⅝
3¼	3¾	½	5/8	7/16	1¾	1¼	3/8	2.76	4⅞ ₁₆	5½
4	4½	½	5/8	7/16	1¾	1¼	3/8	3.32	5⅞ ₁₆	6¼
5	5½	½	5/8	9/16	1¾	1¼	7/16	4.10	6⅝	7⅝
6	6½	¾	¾	9/16	2	1½	7/16	4.88	7⅝	8⅝

SEE TABLE 3
PAGE 2 FOR
ROD END STYLES
AND DIMENSIONS

FLANGE MOUNT

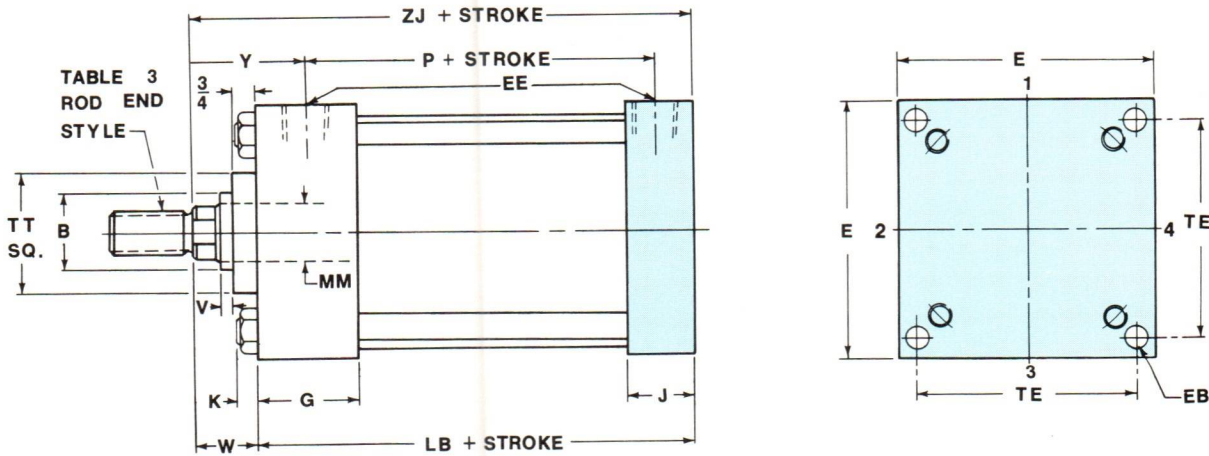
FOR PACKAGE AND MOUNTING DIMENSIONS SEE TABLES 1 AND 2

ROD SQUARE FLANGE MOUNTING



MODEL A21
NFPA STYLE ME3

BLIND SQUARE FLANGE MOUNTING



MODEL A22
NFPA STYLE ME4

Dimensional data (8"-16" BORE)

TABLE 1

The dimensions given on this table are affected by the piston rod diameter and the stroke.

BORE DIA.	ROD MM	CYLINDER CODE #	B	LB	P	TT	V	W	Y	ZB	ZJ
8	1 $\frac{3}{8}$	180	2	5 $\frac{1}{8}$	3 $\frac{1}{4}$	4	1 $\frac{1}{4}$	1 $\frac{5}{8}$	2 $\frac{13}{16}$	7 $\frac{5}{16}$	6 $\frac{3}{4}$
	1 $\frac{3}{4}$	181	2 $\frac{3}{8}$			4	$\frac{3}{8}$	1 $\frac{7}{8}$	3 $\frac{1}{16}$	7 $\frac{9}{16}$	7
	2	182	2 $\frac{5}{8}$			4	$\frac{3}{8}$	2	3 $\frac{3}{16}$	7 $\frac{11}{16}$	7 $\frac{1}{8}$
	2 $\frac{1}{2}$	183	3 $\frac{1}{8}$			4	$\frac{1}{2}$	2 $\frac{1}{4}$	3 $\frac{7}{16}$	7 $\frac{15}{16}$	7 $\frac{3}{8}$
	3	184	3 $\frac{3}{4}$			5 $\frac{1}{2}$					
	3 $\frac{1}{2}$	185	4 $\frac{1}{4}$			5 $\frac{1}{2}$					
	4	186	4 $\frac{3}{4}$			5 $\frac{1}{2}$					
	4 $\frac{1}{2}$	187	5 $\frac{1}{4}$			7					
	5	188	5 $\frac{3}{4}$			7					
	5 $\frac{1}{2}$	189	6 $\frac{1}{4}$			7					
10	1 $\frac{3}{4}$	1100	2 $\frac{3}{8}$	6 $\frac{3}{8}$	4 $\frac{1}{8}$	4	$\frac{3}{8}$	1 $\frac{7}{8}$	3 $\frac{1}{8}$	8 $\frac{15}{16}$	8 $\frac{1}{4}$
	2	1101	2 $\frac{5}{8}$			4	$\frac{3}{8}$	2	3 $\frac{1}{4}$	9 $\frac{1}{16}$	8 $\frac{3}{8}$
	2 $\frac{1}{2}$	1102	3 $\frac{1}{8}$			4	$\frac{1}{2}$	2 $\frac{1}{4}$	3 $\frac{1}{2}$	9 $\frac{5}{16}$	8 $\frac{5}{8}$
	3	1103	3 $\frac{3}{4}$			5 $\frac{1}{2}$					
	3 $\frac{1}{2}$	1104	4 $\frac{1}{4}$			5 $\frac{1}{2}$					
	4	1105	4 $\frac{3}{4}$			5 $\frac{1}{2}$					
	4 $\frac{1}{2}$	1106	5 $\frac{1}{4}$			7					
	5	1107	5 $\frac{3}{4}$			7					
	5 $\frac{1}{2}$	1108	6 $\frac{1}{4}$			7					
12	2	1120	2 $\frac{5}{8}$	6 $\frac{7}{8}$	4 $\frac{5}{8}$	4	$\frac{3}{8}$	2	3 $\frac{1}{4}$	9 $\frac{9}{16}$	8 $\frac{7}{8}$
	2 $\frac{1}{2}$	1121	3 $\frac{1}{8}$			4	$\frac{1}{2}$	2 $\frac{1}{4}$	3 $\frac{1}{2}$	9 $\frac{13}{16}$	9 $\frac{1}{8}$
	3	1122	3 $\frac{3}{4}$			5 $\frac{1}{2}$					
	3 $\frac{1}{2}$	1123	4 $\frac{1}{4}$			5 $\frac{1}{2}$					
	4	1124	4 $\frac{3}{4}$			5 $\frac{1}{2}$					
	4 $\frac{1}{2}$	1125	5 $\frac{1}{4}$			7					
	5	1126	5 $\frac{3}{4}$			7					
	5 $\frac{1}{2}$	1127	6 $\frac{1}{4}$			7					
14	2 $\frac{1}{2}$	1140	3 $\frac{1}{8}$	8 $\frac{1}{8}$	5 $\frac{1}{2}$	4	$\frac{1}{2}$	2 $\frac{1}{4}$	3 $\frac{13}{16}$	11 $\frac{3}{16}$	10 $\frac{3}{8}$
	3	1141	3 $\frac{3}{4}$			5 $\frac{1}{2}$					
	3 $\frac{1}{2}$	1142	4 $\frac{1}{4}$			5 $\frac{1}{2}$					
	4	1143	4 $\frac{3}{4}$			5 $\frac{1}{2}$					
	4 $\frac{1}{2}$	1144	5 $\frac{1}{4}$			7					
	5	1145	5 $\frac{3}{4}$			7					
	5 $\frac{1}{2}$	1146	6 $\frac{1}{4}$			7					
16	2 $\frac{1}{2}$	1160	3 $\frac{1}{8}$	8 $\frac{1}{8}$	5 $\frac{5}{8}$	4	$\frac{1}{2}$	2 $\frac{1}{4}$	3 $\frac{3}{4}$	11 $\frac{3}{16}$	10 $\frac{3}{8}$
	3	1161	3 $\frac{3}{4}$			5 $\frac{1}{2}$					
	3 $\frac{1}{2}$	1162	4 $\frac{1}{4}$			5 $\frac{1}{2}$					
	4	1163	4 $\frac{3}{4}$			5 $\frac{1}{2}$					
	4 $\frac{1}{2}$	1164	5 $\frac{1}{4}$			7					
	5	1165	5 $\frac{3}{4}$			7					
	5 $\frac{1}{2}$	1166	6 $\frac{1}{4}$			7					

HOW TO ORDER

For ordering information refer to Page 30.

NOTES:

#For double rod end cylinders the cylinder code number is to be written with the letter D. (Refer to page 22.)

PORTS:

Series A cylinders are supplied with NPTF tapered pipe threads as standard. The largest size port is provided that can be accommodated by the rod and blind end caps in any given bore size. For further information on different types of ports or oversized ports refer to page 25.

CUSHIONS:

The longest cushion is provided that can be accommodated by the rod and blind end caps in any given bore size. Longer cushions are available; for further information consult the factory.

**SEE TABLE 3
PAGE 2 FOR
ROD END STYLES
AND DIMENSIONS**

TABLE 2

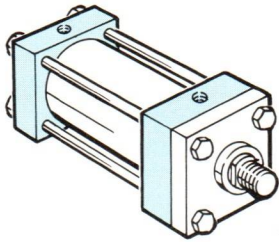
These dimensions are constant regardless of rod diameter or stroke.

BORE DIA.	E	EB	EE	F	G	J	K	R	TE
8	8 $\frac{1}{2}$	1 $\frac{1}{16}$	$\frac{3}{4}$	—	2	1 $\frac{1}{2}$	$\frac{9}{16}$	6.44	7.57
10	10 $\frac{5}{8}$	1 $\frac{3}{16}$	1	—	2 $\frac{1}{4}$	2	1 $\frac{1}{16}$	7.92	9.40
12	12 $\frac{3}{4}$	1 $\frac{3}{16}$	1	—	2 $\frac{1}{4}$	2	1 $\frac{1}{16}$	9.40	11.10
14	14 $\frac{3}{4}$	1 $\frac{5}{16}$	1 $\frac{1}{4}$	—	2 $\frac{3}{4}$	2 $\frac{1}{4}$	1 $\frac{3}{16}$	10.90	12.87
16	17	1 $\frac{1}{16}$	1 $\frac{1}{4}$	—	2 $\frac{3}{4}$	2 $\frac{1}{4}$	1 $\frac{3}{16}$	12.65	14.847

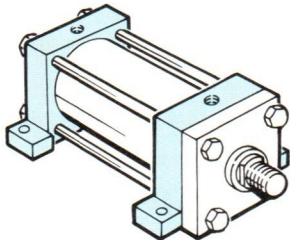
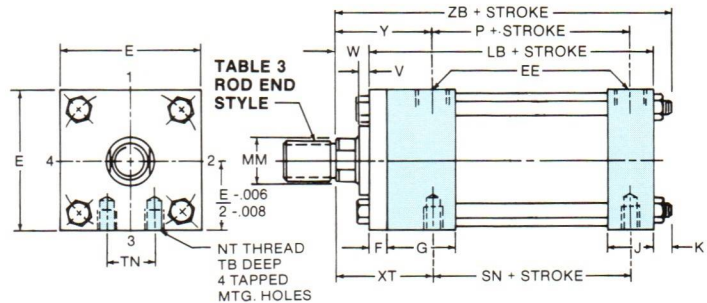
The side or lug mounted cylinder provides a fairly rigid mount. These types of cylinders can tolerate a slight amount of misalignment when the cylinder is at full stroke, but as the piston moves toward the blind end the tolerance for

misalignment decreases. It is important to note that if the cylinder is used properly (without misalignment) the mounting bolts are either in simple shear or tension without any compound stresses.

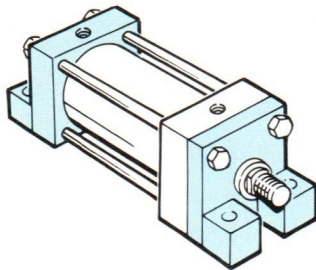
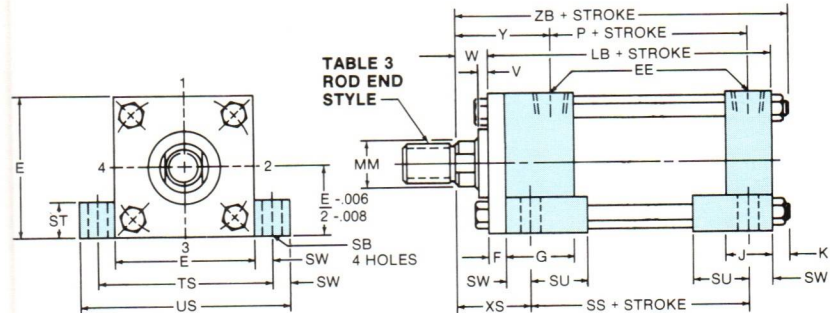
FOR PACKAGE AND MOUNTING DIMENSIONS SEE TABLES 1 AND 2



MODEL A41
NFPA STYLE MS4

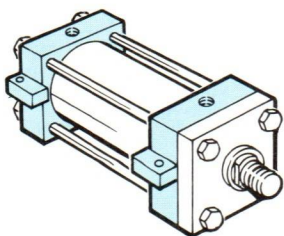
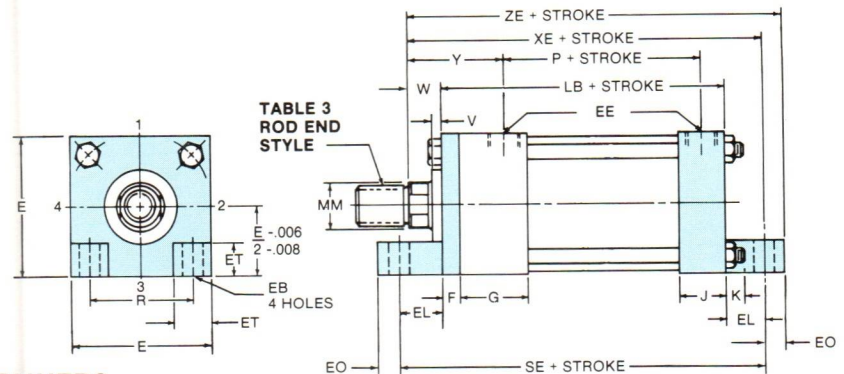


MODEL A42
NFPA STYLE MS2

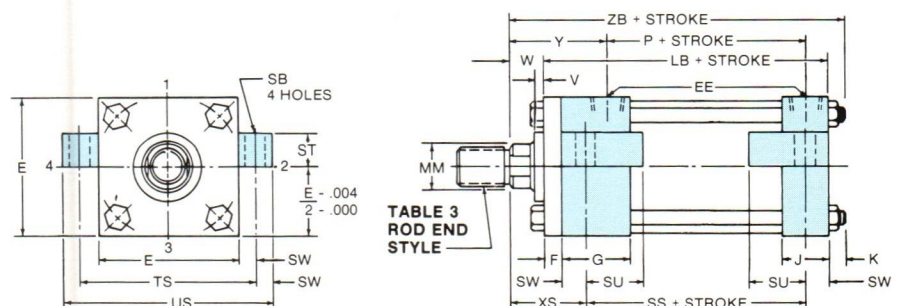


MODEL A43
NFPA STYLE MS7

NOT AVAILABLE WITH REMOVABLE RETAINERS



MODEL A51
NFPA STYLE MS3



Dimensional data

(1½"-6" BORE)

SIDE AND LUG MOUNTS

TABLE 1

The dimensions given on this table are affected by the piston rod diameter and the stroke.

BORE DIA.	ROD MM	CYLINDER CODE #	LB	P	SE±	SN	SS■	V	W	XE	XS	XT	Y	ZB	ZE
1½	5/8	11	4	2¼	5½	2¼	27/8	¼	5/8	53/8	13/8	115/16	115/16	47/8	55/8
	★1	12						½	1	5¾	1¾	25/16	25/16	5¼	6
2	5/8	110	4	2¼	57/8	2¼	27/8	¼	5/8	59/16	13/8	115/16	115/16	415/16	57/8
	★†1	111						½	1	515/16	1¾	25/16	25/16	55/16	6¼
	★•1¾	112						5/8	1¼	63/16	2	29/16	29/16	59/16	6½
2½	5/8	120	4½	2¾	6¼	2¾	3	¼	5/8	513/16	13/8	115/16	115/16	51/16	6½
	1	121						½	1	63/16	1¾	25/16	25/16	57/16	6½
	★†1¾	122						5/8	1¼	67/16	2	29/16	29/16	511/16	6¾
	★•1¾	123						¾	1½	611/16	2¼	213/16	213/16	515/16	7
	1	130						¼	¾	6½	17/8	27/16	27/16	6	67/8
3¼	1¾	131	47/8	25/8	65/8	25/8	3¼	¾	1	6¾	21/8	211/16	211/16	6¼	71/8
	★1¾	132						½	1¼	7	23/8	215/16	215/16	6½	73/8
	★2	133						½	1¾	71/8	2½	31/16	31/16	65/8	7½
	1	140						¼	¾	65/8	17/8	27/16	27/16	6	7
4	1¾	141	47/8	25/8	67/8	25/8	3¼	¾	1	67/8	21/8	211/16	211/16	6¼	7¼
	1¾	142						½	1¼	71/8	23/8	215/16	215/16	6½	7½
	2	143						½	1¾	7¼	2½	31/16	31/16	65/8	75/8
	★2½	144						5/8	15/8	7½	2¾	35/16	35/16	67/8	77/8
	1	150						¼	¾	615/16	21/16	27/16	27/16	65/16	71/16
5	1¾	1x51	51/8	27/8	7¼	27/8	31/8	¾	1	73/16	25/16	211/16	211/16	69/16	711/16
	1¾	1x52						½	1¼	77/16	29/16	215/16	215/16	613/16	715/16
	2	153						½	1¾	79/16	211/16	31/16	31/16	615/16	81/16
	2½	154						5/8	15/8	713/16	215/16	35/16	35/16	73/16	85/16
	3	155						5/8	15/8	713/16	215/16	35/16	35/16	73/16	85/16
	★3½	156						5/8	15/8	713/16	215/16	35/16	35/16	73/16	85/16
	1¾	160						¼	7/8	75/8	25/16	213/16	213/16	71/16	81/8
6	1¾	161	5¾	31/8	7¾	31/8	35/8	¾	11/8	77/8	29/16	31/16	31/16	75/16	83/8
	2	162						¾	1¼	8	211/16	33/16	33/16	77/16	8½
	2½	163						½	1½	8¼	215/16	37/16	37/16	711/16	8¾
	3	164						½	1½	8¼	215/16	37/16	37/16	711/16	8¾
	3½	165						½	1½	8¼	215/16	37/16	37/16	711/16	8¾
	★4	166						½	1½	8¼	215/16	37/16	37/16	711/16	8¾
	1¾	160						¼	7/8	75/8	25/16	213/16	213/16	71/16	81/8

HOW TO ORDER

For ordering information refer to Page 30.

NOTES:

★ Model A41 is not available in these sizes.

† The standard rod eye or rod clevis will interfere with foot lugs on Model A43. When these rod end accessories are required use additional rod extension.

‡ For double rod end cylinders from 1½" thru 6" bore add ½" + F to this dimension.

■ For double rod end cylinders from 1½" thru 6" bore add ½" to this dimension.

• Available with fixed non-adjustable cushions on rod end and standard adjustable cushions on the blind end only.

For double rod end cylinders the cylinder code number is to be written with the letter D before it. (Refer to page 22.)

PORTS:

Series A cylinders are supplied with NPTF tapered pipe threads as standard. The largest size port is provided that can be accommodated by the rod and blind end caps in any given bore size. For further information on different types of ports or oversized ports refer to page 25.

CUSHIONS:

The longest cushion is provided that can be accommodated by the rod and blind end caps in any given bore size. Longer cushions are available; for further information consult the factory.

TABLE 2

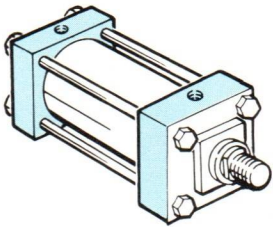
These dimensions are constant regardless of rod diameter or stroke.

BORE DIA.	E	EB	EE	EL	EO	ET	F	G	J	K	NT	R	SB	ST	SU	SW	TB	TN	TS	US
1½	2	5/16	¾	¾	¼	½	¾	1½	1	¼	¼-20	1.43	7/16	½	15/16	¾	¾	5/8	2¾	3½
2	2½	¾	¾	15/16	5/16	19/32	¾	1½	1	5/16	5/16-18	1.84	7/16	½	15/16	¾	9/16	7/8	3¼	4
2½	3	¾	¾	11/16	5/16	¾	¾	1½	1	5/16	¾-16	2.19	7/16	½	15/16	¾	5/8	1¼	3¾	4½
3¼	3¾	7/16	½	7/8	¾	29/32	5/8	1¾	1¼	¾	½-13	2.76	9/16	¾	1¼	½	¾	1½	4¾	5¾
4	4½	7/16	½	1	¾	11/8	5/8	1¾	1¼	¾	½-13	3.32	9/16	¾	1¼	½	1	21/16	5½	6½
5	5½	9/16	½	11/16	½	111/32	5/8	1¾	1¼	7/16	5/8-11	4.10	13/16	1	19/16	11/16	1	211/16	67/8	8¼
6	6½	9/16	¾	1	½	19/16	¾	2	1½	7/16	¾-10	4.88	13/16	1	19/16	11/16	11/8	3¼	77/8	9¼

**SEE TABLE 3
PAGE 2 FOR
ROD END STYLES
AND DIMENSIONS**

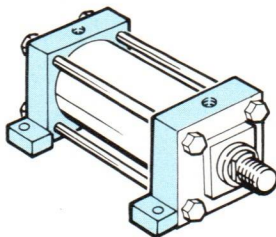
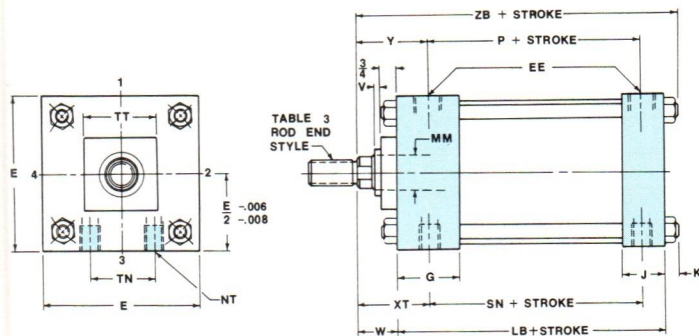
SIDE AND LUG MOUNTS

FOR PACKAGE AND MOUNTING DIMENSIONS SEE TABLES 1 AND 2



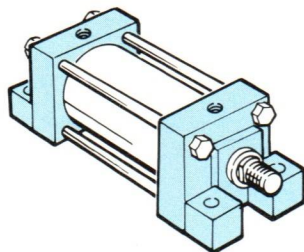
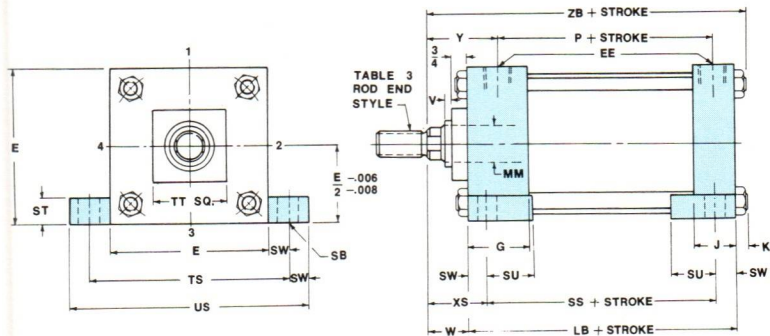
**MODEL A41
NFBA STYLE MS4**

TAPPED HOLES IN CAPS FLUSH MOUNTING



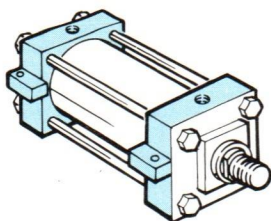
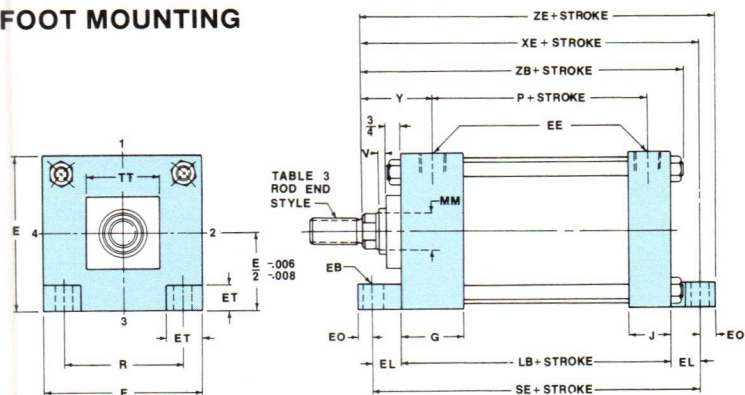
**MODEL A42
NFPA STYLE MS2**

SIDE LUG MOUNTING



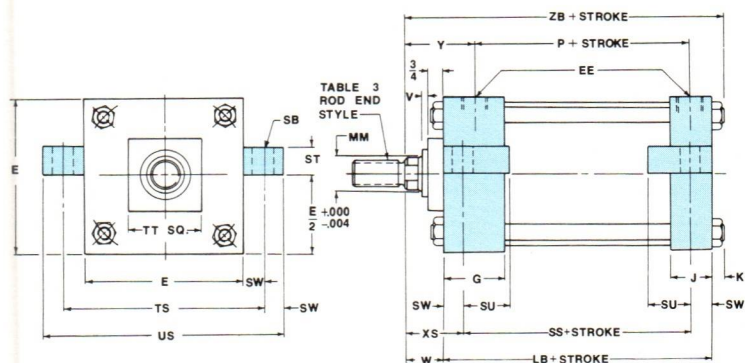
**MODEL A43
NFPA STYLE MS7**

FOOT MOUNTING



**MODEL A51
NFPA STYLE MS3**

CENTERLINE LUG MOUNTING



Dimensional data

(8"-16" BORE)

TABLE 1 The dimensions given on this table are affected by the piston rod diameter and the stroke.

BORE DIA.	ROD MM	CYLINDER CODE #	LB	P	SE	SN	SS	TT	V	W	XE	XS	XT	Y	ZB	ZE
8	1 3/8	180	5 1/8	3 1/4	7 3/8	3 1/4	3 3/4	4	1/4	1 5/8	7 7/8	2 5/16	2 13/16	2 13/16	7 5/16	8 1/2
	1 3/4	181						4	3/8	1 7/8	8 1/8	2 9/16	3 1/16	3 1/16	7 9/16	8 3/4
	2	182						4	3/8	2	8 1/4	2 11/16	3 3/16	3 3/16	7 11/16	8 7/8
	2 1/2	183						4								
	3	184						5 1/2								
	3 1/2	185						5 1/2								
	4	186						5 1/2	1/2	2 1/4	8 1/2	2 15/16	3 7/16	3 7/16	7 15/16	9 1/8
	4 1/2	187						7								
	5	188						7								
	5 1/2	189						7								
10	1 3/4	1100	6 3/8	4 1/8	9	4 1/8	4 5/8	4	3/8	1 7/8	9 9/16	2 3/4	3 1/8	3 1/8	8 15/16	10 3/16
	2	1101						4	3/8	2	9 11/16	2 7/8	3 1/4	3 1/4	9 1/16	10 5/16
	2 1/2	1102						4								
	3	1103						5 1/2								
	3 1/2	1104						5 1/2								
	4	1105						5 1/2	1/2	2 1/4	9 15/16	3 1/8	3 1/2	3 1/2	9 5/16	10 9/16
	4 1/2	1106						7								
	5	1107						7								
	5 1/2	1108						7								
12	2	1120	6 7/8	4 5/8	9 1/2	4 5/8	5 1/8	4	3/8	2	10 3/16	2 7/8	3 1/4	3 1/4	9 9/16	10 13/16
	2 1/2	1121						4								
	3	1122						5 1/2								
	3 1/2	1123						5 1/2								
	4	1124						5 1/2	1/2	2 1/4	10 7/16	3 1/8	3 1/2	3 1/2	9 13/16	11 1/16
	4 1/2	1125						7								
	5	1126						7								
	5 1/2	1127						7								
14	2 1/2	1140	8 1/8	5 1/2	11 1/8	5 1/2	5 7/8	4								
	3	1141						5 1/2								
	3 1/2	1142						5 1/2								
	4	1143						5 1/2	1/2	2 1/4	11 7/8	3 3/8	3 13/16	3 13/16	11 3/16	12 5/8
	4 1/2	1144						7								
	5	1145						7								
	5 1/2	1146						7								
16	2 1/2	1160	8 1/8	5 5/8	11 1/4	5 1/2	5 7/8	4								
	3	1161						5 1/2								
	3 1/2	1162						5 1/2								
	4	1163						5 1/2	1/2	2 1/4	11 7/8	3 3/8	3 13/16	3 3/4	11 3/16	12 3/8
	4 1/2	1164						7								
	5	1165						7								
	5 1/2	1166						7								

HOW TO ORDER

For ordering information refer to Page 30.

NOTES:

■ For double rod end cylinders from 8" thru 16" bore add 1/4" to this dimension (except 12" bore, add 1/2").

For double rod end cylinders the cylinder code number is to be written with the letter D before it. (Refer to page 22.)

PORTS:

Series A cylinders are supplied with NPTF tapered pipe threads as standard. The largest size port is provided that can be accommodated by the rod and blind end caps in any given bore size. For further information on different types of ports or oversized ports refer to page 25.

CUSHIONS:

The longest cushion is provided that can be accommodated by the rod and blind end caps in any given bore size. Longer cushions are available; for further information consult the factory.

TABLE 2 These dimensions are constant regardless of rod diameter or stroke.

BORE DIA.	E	EB	EE	EL	EO	ET	F	G	J	K	NT	R	SB	ST	SU	SW	TB	TN	TS	US
8	8 1/2	1 1/16	3/4	1 1/8	5/8	2	—	2	1 1/2	9/16	3/4-10	6.44	1 3/16	1	1 9/16	1 1/16	1 1/8	4 1/2	9 7/8	11 1/4
10	10 5/8	1 3/16	1	1 5/16	5/8	2 5/8	—	2 1/4	2	1 1/16	1 -8	7.92	1 1/16	1 1/4	2	7/8	1 5/8	5 1/2	12 3/8	14 1/8
12	12 3/4	1 3/16	1	1 5/16	5/8	3 9/32	—	2 1/4	2	1 1/16	1 -8	9.40	1 1/16	1 1/4	2	7/8	1 5/8	7 1/4	14 1/2	16 1/4
14	14 3/4	1 5/16	1 1/4	1 1/2	3/4	3 25/32	—	2 3/4	2 1/4	1 3/16	1 1/4-7	10.90	1 5/16	1 1/2	2 1/2	1 1/8	2 1/4	8 3/8	17	19 1/4
16	17	1 11/16	1 1/4	2	1 1/8	3 5/8	—	2 3/4	2 1/4	1 3/16	1 3/8-6	12.65	1 5/16	1 1/2	2 1/2	1 1/8	2 1/2	9 3/4	19 1/4	22

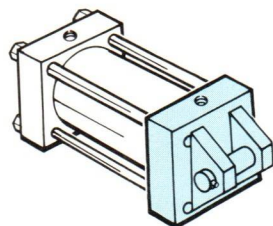
SEE TABLE 3
PAGE 2 FOR
ROD END STYLES
AND DIMENSIONS

PIN AND TRUNNION MOUNTS

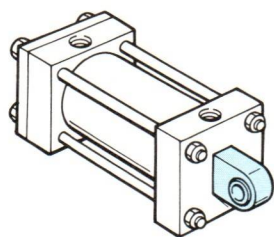
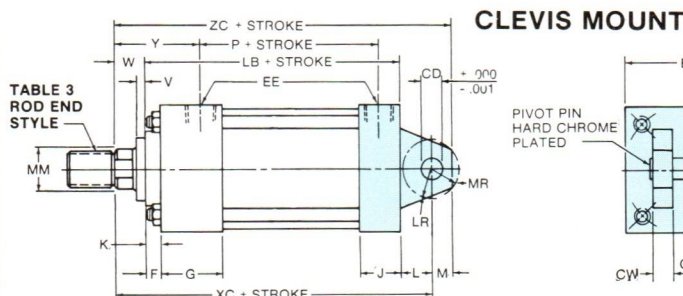
All pin and trunnion cylinders need a provision on both ends for pivoting. These types of cylinders are designed to carry shear loads and

the trunnion and pivot pins should be carried by bearings that are rigidly held and closely fit for the entire length of the pin.

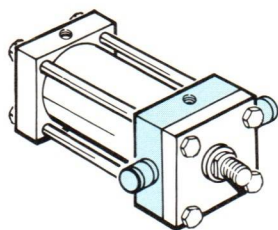
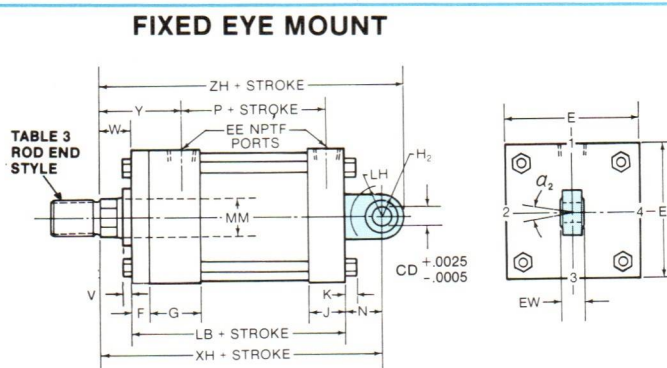
FOR PACKAGE AND MOUNTING DIMENSIONS SEE TABLES 1 AND 2



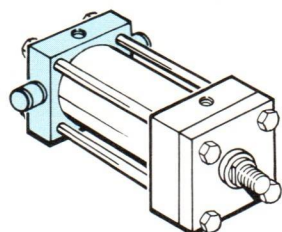
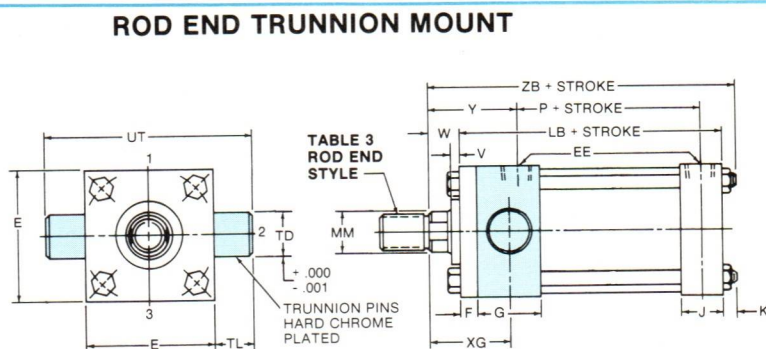
**MODEL A61
NFPA STYLE MP1**



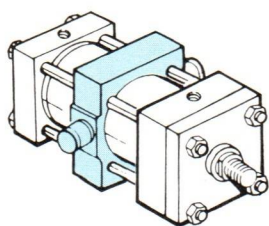
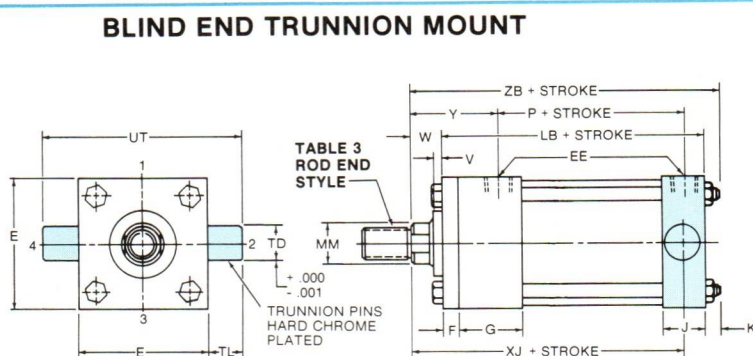
MODEL A62



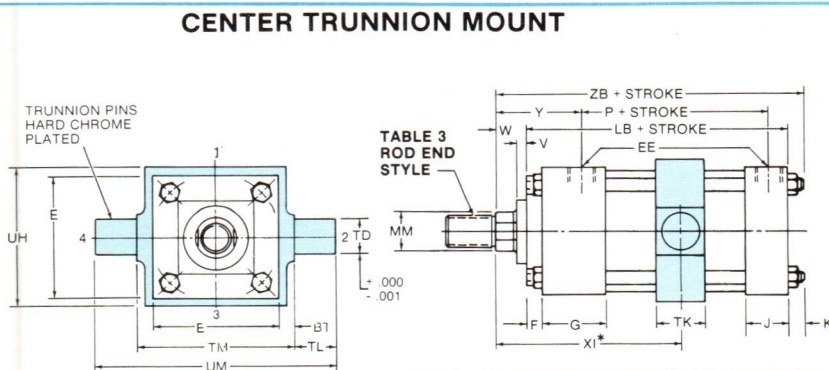
**MODEL A71
NFPA STYLE MT1**



**MODEL A72
NFPA STYLE MT2**



**MODEL A73
NFPA STYLE MT4**



*Note: Customer to specify XI dimension

PIN AND TRUNNION MOUNTS

Dimensional data

(1½" - 6" BORE)

TABLE 1 The dimensions given on this table are affected by the piston rod diameter and the stroke.

BORE DIA.	ROD MM	CYLINDER CODE #	LB	P	V	W	XC	XG	XH	XJ	Y	ZB	ZC	ZH
1½	5/8	11	4	2¼	¼	5/8	5¾	1¾	5½	4⅞	1⅝ ¹⁶	4⅞	5⅞	6¼
	•1 *	12			½	1	5¾	2⅞	5⅞	4½	2⅝ ¹⁶	5¼	6¼	6⅝
2	5/8	110	4	2¼	¼	5/8	5¾	1¾	5½	4⅞	1⅝ ¹⁶	4⅝ ¹⁶	5⅞	6¼
	1	111			½	1	5¾	2⅞	5⅞	4½	2⅝ ¹⁶	5⅝ ¹⁶	6¼	6⅝
	•1¾ *	112			5/8	1¼	6	2¾	6⅞	4¾	2⅝ ¹⁶	5⅝ ¹⁶	6½	6⅞
2½	5/8	120	4⅞	2¾	¼	5/8	5½	1¾	5⅝	4¼	1⅝ ¹⁶	5⅝ ¹⁶	6	6¾
	1	121			½	1	5⅞	2⅞	6	4⅝	2⅝ ¹⁶	5⅝ ¹⁶	6¾	6¾
	1¾	122			5/8	1¼	6⅞	2¾	6¼	4⅞	2⅝ ¹⁶	5⅝ ¹⁶	6⅝	7
	•1¾ *	123			¾	1½	6¾	2⅝	6¾	5⅞	2⅝ ¹⁶	5⅝ ¹⁶	6⅞	7⅞
3¼	1	130	4⅞	2⅝	¼	¾	6⅞	2¼	6⅞	5	2⅝ ¹⁶	6	7⅝	8⅞
	1¾	131			¾	1	7⅞	2½	7⅞	5¼	2⅝ ¹⁶	6¼	7⅞	8¾
	1¾	132			½	1¼	7¾	2¾	7¾	5½	2⅝ ¹⁶	6½	8⅞	8⅝
	2 *	133			½	1¾	7½	2⅞	7½	5⅝	3⅝ ¹⁶	6⅝	8¼	8¾
4	1	140	4⅞	2⅝	¼	¾	6⅞	2¼	6⅞	5	2⅝ ¹⁶	6	7⅝	8⅞
	1¾	141			¾	1	7⅞	2½	7⅞	5¼	2⅝ ¹⁶	6¼	7⅞	8¾
	1¾	142			½	1¼	7¾	2¾	7¾	5½	2⅝ ¹⁶	6½	8⅞	8⅝
	2	143			½	1¾	7½	2⅞	7½	5⅝	3⅝ ¹⁶	6⅝	8¼	8¾
	2½ *	144			5/8	1⅝	7¾	3⅞	7¾	5⅞	3⅝ ¹⁶	6⅞	8½	9
5	1	1x50	5⅞	27/8	¼	¾	7⅞	2¼	7⅞	5¼	2⅝ ¹⁶	6⅝ ¹⁶	7⅞	8¾
	1¾	1x51			¾	1	7¾	2½	7¾	5½	2⅝ ¹⁶	6⅝ ¹⁶	8⅞	8⅝
	1¾	1x52			½	1¼	7⅝	2¾	7⅝	5¾	2⅝ ¹⁶	6⅝ ¹⁶	8¾	8⅞
	2	153			½	1¾	7¾	2⅞	7¾	5⅞	3⅝ ¹⁶	6⅝ ¹⁶	8½	9
	2½	154			5/8	1⅝	8	3⅞	8	6⅞	3⅝ ¹⁶	7⅝ ¹⁶	8¾	9¼
	3	155			5/8	1⅝	8	3⅞	8	6⅞	3⅝ ¹⁶	7⅝ ¹⁶	8¾	9¼
	3½ *	156			5/8	1⅝	8	3⅞	8	6⅞	3⅝ ¹⁶	7⅝ ¹⁶	8¾	9¼
6	1¾	160	5¾	3⅞	¼	7/8	8⅞	2⅝	8¼	5⅞	2⅝ ¹⁶	7⅝ ¹⁶	9⅞	10
	1¾	161			¾	1⅞	8¾	2⅞	8½	6⅞	3⅝ ¹⁶	7⅝ ¹⁶	9¾	10¼
	2	162			¾	1¼	8½	3	8⅝	6¼	3⅝ ¹⁶	7⅝ ¹⁶	9½	10¾
	2½	163			½	1½	8¾	3¼	8⅞	6½	3⅝ ¹⁶	7⅝ ¹⁶	9¾	10⅝
	3	164			½	1½	8¾	3¼	8⅞	6½	3⅝ ¹⁶	7⅝ ¹⁶	9¾	10⅝
	3½	165			½	1½	8¾	3¼	8⅞	6½	3⅝ ¹⁶	7⅝ ¹⁶	9¾	10⅝
	4	166			½	1½	8¾	3¼	8⅞	6½	3⅝ ¹⁶	7⅝ ¹⁶	9¾	10⅝

HOW TO ORDER

For ordering information refer to Page 30.

NOTES:

#For double rod end cylinders the cylinder code number is to be written with the letter D. (Refer to page 22.)

•Available with fixed-nonadjustable cushions on rod end and standard adjustable cushions on the blind end only.

*Removable retainer not available for these bore and rod combinations in the A61 and A73 mounting styles.

PORTS:

Series A cylinders are supplied with NPTF tapered pipe threads as standard. The largest size port is provided that can be accommodated by the rod and blind end caps in any given bore size. For further information on different types of ports or oversized ports refer to page 25.

CUSHIONS:

The longest cushion is provided that can be accommodated by the rod and blind end caps in any given bore size. Longer cushions are available; for further information consult the factory.

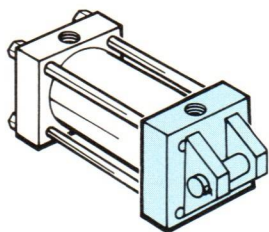
SEE TABLE 3
PAGE 2 FOR
ROD END STYLES
AND DIMENSIONS

TABLE 2 These dimensions are constant regardless of rod diameter or stroke.

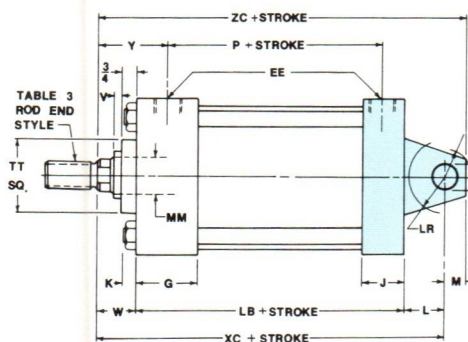
BORE DIA.	a ₂	BT	CB	CD	CW	E	EE	EW	F	G	H ₂	J	K	L	LH	LR	M	MR	N	TD	TK	TL	TM	UH	UM	UT
1½	13°	¾	¾	½	½	2	¾	5/8	¾	1½	1¾	1	¼	¾	5/8	5/8	½	2⅝ ³²	7/8	1	1⅞	1	3½	2¾	5½	4
2	13°	¾	¾	½	½	2½	¾	5/8	¾	1½	1¾	1	5/16	¾	5/8	5/8	½	1⅝ ¹⁶	7/8	1	1⅞	1	4	2⅞	6	4½
2½	13°	¾	¾	½	½	3	¾	5/8	¾	1½	1¾	1	5/16	¾	5/8	5/8	½	1⅝ ¹⁶	7/8	1	1⅞	1	4½	3¾	6½	5
3¼	14°	¾	1¼	¾	5/8	3¾	½	7/8	5/8	1¾	1¼	¾	3/8	1¼	1	1⅝ ¹⁶	¾	1⅝ ¹⁶	1¼	1	1¼	1	5¼	4⅞	7¼	5¾
4	14°	¾	1¼	¾	5/8	4½	½	7/8	5/8	1¾	1¼	¾	3/8	1¼	1	1⅝ ¹⁶	¾	1⅝ ¹⁶	1¼	1	1¼	1	6	5	8	6½
5	14°	¾	1¼	¾	5/8	5½	½	7/8	5/8	1¾	1¼	¾	7/16	1¼	1	1⅝ ¹⁶	¾	1⅝ ¹⁶	1¼	1	1¼	1	7	6	9	7½
6	12½°	1	1½	1	¾	6½	¾	1¾	¾	2	1¾	1½	7/16	1½	1¼	1	1¾	1⅝	1¾	1½	1¾	1	8½	7	11¼	9¼

PIN AND TRUNNION MOUNTS

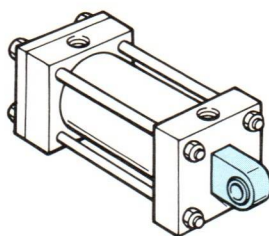
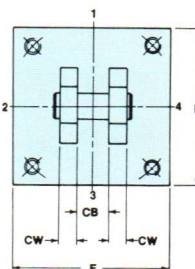
FOR PACKAGE AND MOUNTING DIMENSIONS SEE TABLES 1 AND 2



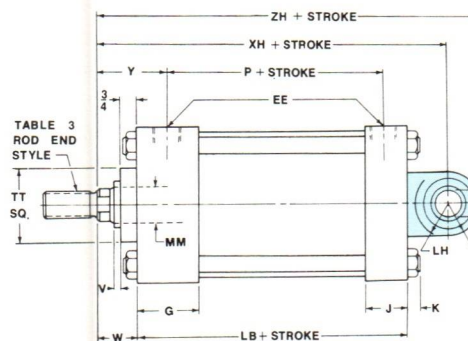
**MODEL A61
NFPA STYLE MP1**



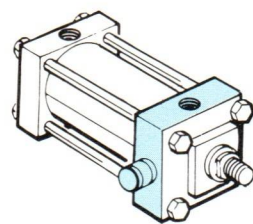
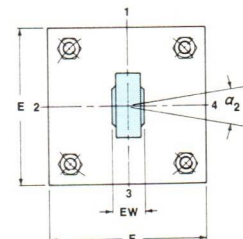
CLEVIS MOUNT



MODEL A62

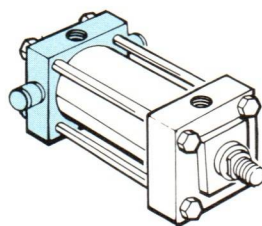
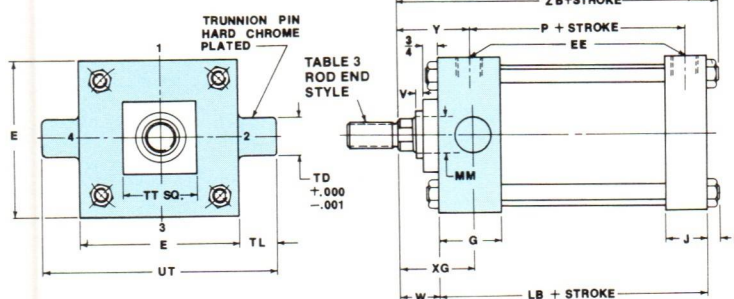


FIXED EYE MOUNT



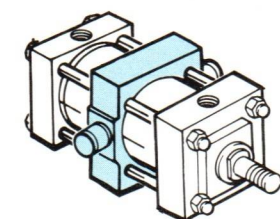
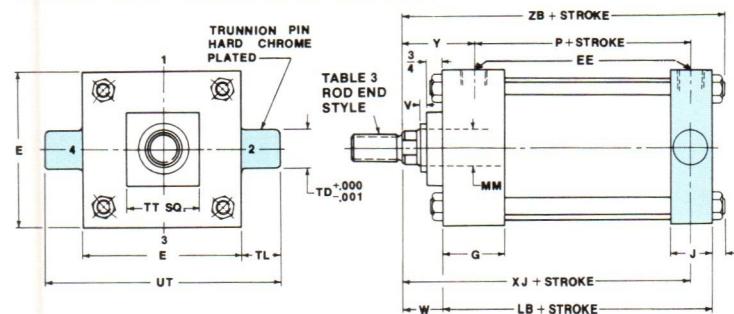
**MODEL A71
NFPA STYLE MT1**

ROD END TRUNNION MOUNT



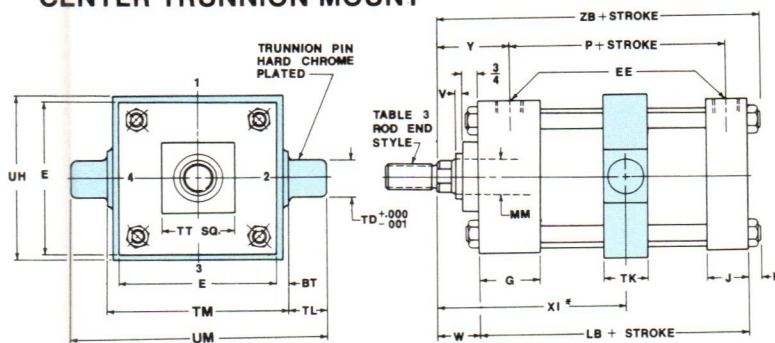
**MODEL A72
NFPA STYLE MT2**

BLIND END TRUNNION MOUNT



**MODEL A73
NFPA STYLE MT4**

CENTER TRUNNION MOUNT



* Customer to specify X1 dimension

Dimensional data (8"-16" BORE)

TABLE 1 The dimensions given on this table are affected by the piston rod diameter and the stroke.

BORE DIA.	ROD MM	CYLINDER CODE #	LB	P	TT	V	W	XC	XG	XH	XJ	Y	ZB	ZC	ZH
8	1⅜	180	5⅛	3¼	4	¼	1⅝	8¼	2⅝	8⅜	6	2⅓ ₁₆	7⅝ ₁₆	9¼	10⅞
	1¾	181			4	⅜	1⅞	8½	2⅞	8⅝	6¼	3⅓ ₁₆	7⅑ ₁₆	9½	10⅜
	2	182			4	⅜	2	8⅝	3	8¾	6⅜	3⅑ ₁₆	7⅒ ₁₆	9⅝	10½
	2½	183			4	½	2¼	8⅞	3¼	9	6⅝	3⅞ ₁₆	7⅒ ₁₆	9⅞	10¾
	3	184			5½										
	3½	185			5½										
	4	186			5½										
	4½	187			7										
	5	188			7										
	5½	189			7										
10	1¾	1100	6⅜	4⅛	4	⅜	1⅞	10⅜	3		7¼	3⅛	8⅒ ₁₆	11¾	
	2	1101			4	⅜	2	10½	3⅛		7⅜	3¼	9⅓ ₁₆	11⅞	
	2½	1102			4	½	2¼	10¾	3⅜	—	7⅝	3½	9⅝ ₁₆	12⅛	—
	3	1103			5½										
	3½	1104			5½										
	4	1105			5½										
	4½	1106			7										
	5	1107			7										
	5½	1108			7										
12	2	1120	6⅞	4⅝	4	⅜	2	11⅛	3⅛		7⅞	3¼	9⅑ ₁₆	12⅞	
	2½	1121			4	½	2¼	11⅜	3⅜	—	8⅛	3½	9⅓ ₁₆	13⅛	—
	3	1122			5½										
	3½	1123			5½										
	4	1124			5½										
	4½	1125			7										
	5	1126			7										
	5½	1127			7										
14	2½	1140	8⅛	5½	4	½	2¼	12⅞	3⅝	—	9¼	3⅓ ₁₆	11⅓ ₁₆	14⅞	—
	3	1141			5½										
	3½	1142			5½										
	4	1143			5½										
	4½	1144			7										
	5	1145			7										
	5½	1146			7										
16	2½	1160	8⅛	5⅝	4	½	2¼	14⅜	3⅝	—	9¼	3¾	11⅓ ₁₆	16⅞	—
	3	1161			5½										
	3½	1162			5½										
	4	1163			5½										
	4½	1164			7										
	5	1165			7										
	5½	1166			7										

HOW TO ORDER

For ordering information refer to Page 30.

NOTES:

#For double rod end cylinders the cylinder code number is to be written with the letter D. (Refer to page 22.)

PORTS:

Series A cylinders are supplied with NPTF tapered pipe threads as standard. The largest size port is provided that can be accommodated by the rod and blind end caps in any given bore size. For further information on different types of ports or oversized ports refer to page 25.

CUSHIONS:

The longest cushion is provided that can be accommodated by the rod and blind end caps in any given bore size. Longer cushions are available; for further information consult the factory.

SEE TABLE 3
PAGE 2 FOR
ROD END STYLES
AND DIMENSIONS

TABLE 2 These dimensions are constant regardless of rod diameter or stroke.

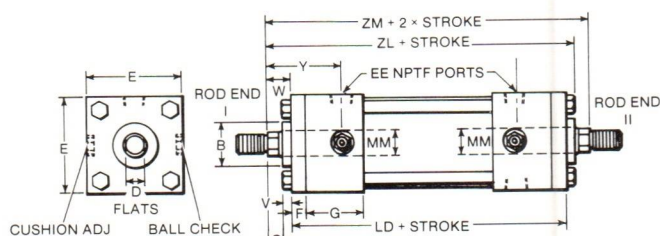
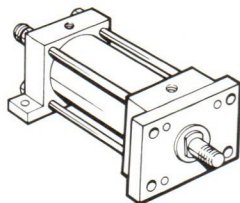
BORE DIA.	a ₂	BT	CB	CD	CW	E	EE	EW	F	G	H ₂	J	K	L	LH	LR	M	MR	N	TD	TK	TL	TM	UH	UM	UT
8	12 1/2	1	1 1/2	1	3/4	8 1/2	3/4	1 3/8	—	2	1 3/4	1 1/2	9/16	1 1/2	1 1/4	1 1/4	1	1 3/16	1 5/8	1 3/8	1 1/2	1 3/8	10 1/2	9	13 1/4	11 1/4
10	—	1 1/4	2	1 3/8	1	10 5/8	1	—	—	2 1/4	—	2	1 1/16	2 1/8	—	1 7/8	1 3/8	1 3/8	—	1 3/4	2	1 3/4	13 1/8	11	16 5/8	14 1/8
12	—	1 1/4	2 1/2	1 3/4	1 1/4	12 3/4	1	—	—	2 1/4	—	2	1 1/16	2 1/4	—	2	1 3/4	1 3/4	—	1 3/4	2	1 3/4	15 1/4	13 3/8	18 3/4	16 1/4
14	—	1 1/2	2 1/2	2	1 1/4	14 3/4	1 1/4	—	—	2 3/4	—	2 1/4	1 3/16	2 1/2	—	2 1/4	2	2	—	2	2 1/4	2	17 3/4	15 3/8	21 3/4	18 3/4
16	—	1 1/2	3	2	1 1/4	17	1 1/4	—	—	2 3/4	—	2 1/4	1 3/16	4	—	3 5/8	2 1/2	3	—	2	2 1/4	2	20	18	24	21 1/2

DOUBLE ROD END CYLINDERS

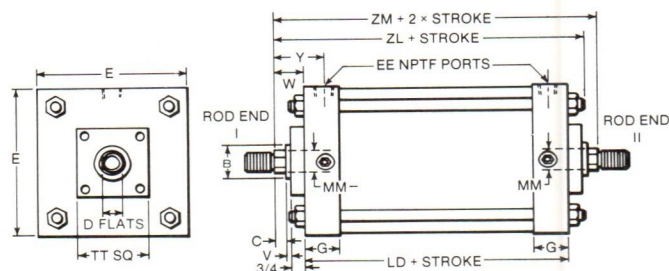
Milwaukee's double rod end cylinders are available with all the standard types of mountings except 61 and 62. When specified by the customer, the standard mountings offered by Milwaukee Cylinder may be combined. Combinations such as a 31 mounting on one end and a 42 mounting on the other can be readily made from standard parts.

To obtain dimensioning information on a double rod end cylinder, first select the desired mounting style and refer to the corresponding single rod end cylinder model shown on the preceding pages. After you have determined all necessary dimensions from the previous page covering the desired mounting, turn back to this page. Supplement those dimensions with additional ones from the drawings below and the table at the right. These added dimensions differ from, or are in addition to, those shown on the preceding pages and provide the additional information needed to completely dimension a double rod end cylinder model.

On a double rod end cylinder where two different rod ends are required or two different rod sizes are required or cushions on one end are required, be sure to state clearly which rod is to go at which end of the cylinder. When two types of mounting styles are required be sure to specify their relationship to the piston rods if they are not the same.



1-1/2" THRU 6" BORE



8" THRU 16" BORE

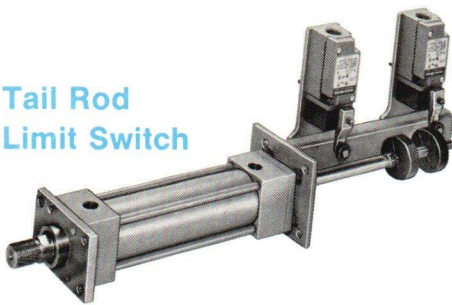
*Note:

These dimensions are to be substituted for the related mounting dimensions given on the preceding pages. All dimensions given on this table are plus stroke.

BORE DIA.	ROD MM	CYLINDER CODE*	LD*	SE,*	SS,*	XE,*	ZE,*	ZL	ZM	ZT,*
1½	5⁄8	D11	47⁄8	63⁄8	33⁄8	6½	6½	5¾	6⅛	6⅝
	1	D12				6⅞	6⅞	6⅛	6⅞	6⅞
2	5⁄8	D110	47⁄8	6¾	33⁄8	6⅞	6¾	5⅜	6⅛	6⅝
	1	D111				6⅜	7⅛	6⅜	6⅞	7
	1⅜	D112				7⅞	7⅜	6⅞	7⅜	7¼
2½	5⁄8	D120	5	7⅛	3½	6⅞	7	5⅞	6¼	5¾
	1	D121				7⅞	7⅜	6⅞	7	7⅞
	1⅜	D122				7⅞	7⅜	6⅞	7½	7⅜
	1¾	D123				7⅞	7⅞	6⅜	8	7⅝
3¼	1	D130	6	7¾	3¾	7⅞	8	7⅛	7½	8⅛
	1⅜	D131				7⅞	8¼	7⅜	8	8⅜
	1¾	D132				8⅛	8½	7⅜	8½	8⅞
	2	D133				8¼	8⅝	7¾	8¾	8¾
4	1	D140	6	8	3¾	7¾	8⅛	7⅛	7½	8⅛
	1⅜	D141				8	8⅜	7⅜	8	8⅜
	1¾	D142				8¼	8⅝	7⅝	8½	8⅝
	2	D143				8⅜	8¾	7¾	8¾	8¾
	2½	D144				8⅝	9	8	9¾	9
5	1	D1X50	6¼	8⅜	3⅝	8⅞	8⅞	7⅞	7¾	8⅜
	1⅜	D1X51				8⅞	8⅜	7⅞	8¼	9⅞
	1¾	D1X52				8⅞	9⅞	7⅞	8¾	9⅞
	2	D153				8⅞	9⅞	8⅞	9	9⅞
	2½	D154				8⅞	9⅞	8⅞	9½	9⅞
	3	D155								
3½	D156									
6	1⅜	D160	7	8⅞	4⅞	8⅞	9⅞	8⅞	8¾	9⅞
	1¾	D161				9⅞	9⅞	8⅞	9¼	9⅞
	2	D162				9¼	9¾	8⅞	9½	10⅞
	2½	D163				9½	10	8⅞	10	10⅞
	3	D164								
	3½	D165								
4	D166									
8	1⅜	D180	5⅞	7⅞	4¼	8⅞	9	7⅞	8⅞	9⅞
	1¾	D181				8⅞	9¼	8⅞	9⅞	9⅞
	2	D182				8¾	9⅞	8⅞	9⅞	9⅞
	2½	D183				9	9⅞	8⅞	10⅞	10⅞
	3	D184								
	3½	D185								
	4	D186								
	4½	D187								
	5	D188								
5½	D189									
10	1¾	D1100	6⅞	9¼	4⅞	9⅞	10⅞	9⅞	10⅞	11⅞
	2	D1101				9⅞	10⅞	9⅞	10⅞	11⅞
	2½	D1102				10⅞	10⅞	9⅞	11⅞	11⅞
	3	D1103								
	3½	D1104								
	4	D1105								
	4½	D1106								
	5	D1107								
5½	D1108									
12	2	D1120	7⅞	9¾	5⅞	10⅞	11⅞	9⅞	11⅞	11⅞
	2½	D1121				10⅞	11⅞	10⅞	11⅞	12⅞
	3	D1122								
	3½	D1123								
	4	D1124								
	4½	D1125								
	5	D1126								
5½	D1127									
14	2½	D1140	8⅞	11⅞	6⅞	12⅞	13⅞	11⅞	13⅞	14⅞
	3	D1141								
	3½	D1142								
	4	D1143								
	4½	D1144								
	5	D1145								
5½	D1146									
16	2½	D1160	8⅞	11¾	6⅞	12⅞	13⅞	11⅞	13⅞	14⅞
	3	D1161								
	3½	D1162								
	4	D1163								
	4½	D1164								
	5	D1165								
5½	D1166									

LIMIT SWITCH CYLINDERS

Tail Rod Limit Switch



Milwaukee's "Tail Rod Limit Switch" cylinder combines an adjustable switch bracket and a standard double rod end Milwaukee cylinder. The switch bracket assembly, supporting adjustable switches, is fastened to the tie rods. As the cylinder strokes, tail rod switch dogs actuate the switches.

The limit switch used is a standard, off the shelf modular type unit. The base is solidly mounted on the switch bracket. The lever arm, operating head and switch mechanism is contained in a separate modular plug in unit which can be removed without disturbing the electrical connections.

Special Advantages

This design offers four very important advantages:

1. The switch can be located and actuated anywhere within the stroke including the extreme ends of stroke.
2. A commercial, off the shelf limit switch is externally mounted and there are no special enclosures.
3. This design will not effect the service life of the cylinder.
4. The switches can be installed in any one of 16 positions to avoid interference with your machine elements.

With Milwaukee's "Tail Rod Limit Switch" cylinder you will save both in initial costs and in future maintenance costs.

The Switch Bracket

The "Switch Bracket" consists of a mounting bracket, switch dog assembly, two switch plates and two limit switches. Because it operates off a tail rod it's adaptable to a wide range of cylinders. It is primarily designed for use with a "Micro

Switch" brand limit switch, but will readily adapt to other brands of lever actuated switches with minor changes to the switch plates.

This unit is designed for simple coarse and fine adjustment. The switch plates are moveable along the switch bracket track to provide coarse adjustment. Fine adjustment is provided by turning the switch dog on the threaded tail rod.

The Limit Switch

The "Micro Switch" brand limit switch is a standard commercial unit obtainable from your local supplier. This switch meets all NEMA requirements for classifications 1, 4 and 13 and is oil, water and dust-proof. Its modular construction permits removal and replacement without disconnecting any wiring.

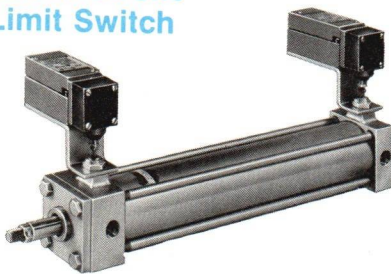
HOW TO ORDER

For all other information other than standard cylinder specifications refer to LIT. NO. 46-2-77 the Tail Rod Limit Switch

bulletin. When ordering Tail Rod Limit Switch cylinders specify the following on your order:

- | | |
|-------------------|-------------------------------------|
| 1. Bore Size | 5. Cushion requirements |
| 2. Rod Size | 6. Rod End Style |
| 3. Stroke | 7. Operating Pressure |
| 4. Mounting Style | 8. Cylinder Code #46-xxxx |
| | (xxxx = The standard cylinder code) |

End of Stroke Limit Switch



Milwaukee's "End of Stroke" limit switch cylinder consists of a standard cylinder with actuator equipped end caps and externally mounted limit switches. The design of this unit offers three very important advantages:

1. Cylinder cushion bushings and spuds are not required for limit switch actuation.
2. A commercial off the shelf limit switch is externally mounted. There are no special enclosures or internally mounted switch parts.
3. The actuator is in hydraulic balance.

These special advantages will save you money both in initial costs and future maintenance costs.

The Actuator and Limit Switch Units

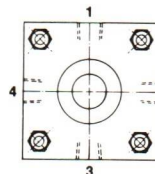
The mechanical actuator, enclosed within the cylinder head is rugged and dependable. Because it operates off the piston face, it is adaptable to a wide range of cylinder bore and rod sizes. Unlike most competitive units, the Milwaukee actuator is in perfect hydraulic balance. This means the return spring must overcome seal friction only. The actuator is factory lubricated so air lubricators are not required unless there is need to lubricate the cylinder itself.

The Micro Switch (LSW1A5) brand limit switch is a standard commercial unit obtainable from your local supplier.

This switch meets all NEMA requirements for classifications 1, 4, and 13 and is oil, water and dust proof. Its modular construction permits removal and replacement without disconnecting any wiring.

The combination of a high quality job-proven Milwaukee cylinder and a standard commercial limit switch results in a rugged dependable unit. You can expect an exceptionally long service life with a minimum of maintenance.

Cylinder Specifications



1. Cylinder position #1 is standard for limit switch location.
2. Cylinder position #2 is standard port location for all models except 71, 72 and 51; on these models standard port position is #3.

3. Cushions are available on all bore and rod combinations shown in this catalog, but are not required to actuate the limit switch. If ordering model 41 with cushions consult the factory.

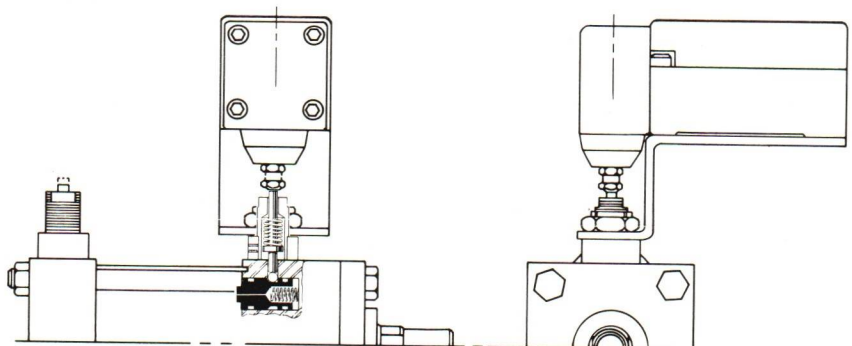
4. Available with 2" thru 16" bore air cylinders and 2" thru 12" bore glass cylinders.

When ordering end of stroke limit switch cylinders specify the following on your order:

1. Bore Size
 2. Rod Size
 3. Stroke
 4. Mounting Style
 5. Cushion requirements
 6. Rod End Style
 7. Operating Pressure
 8. Cylinder Code #45-xxxx
- (xxxx = The standard cylinder code)

NOTE:

For all other information other than the standard cylinder specifications refer to Lit. No. 45-2-77 the End of Stroke Limit Switch bulletin.



Modifications

Special Cylinders

MILWAUKEE CYLINDER has two basic identities as a cylinder producer. The first, as a supplier of standard Hydraulic and Air Cylinders. The second as a specialist in the design and manufacture of totally unique cylinders to suit the wide range of applications for cylinders being developed into today's industry. Milwaukee is a customer and engineering orientated company which gladly welcomes a challenge to meet every customer's unique needs in the area of specials. For information on what data is required by Milwaukee to develop a design to suit your needs contact either your local Milwaukee representative or the factory.

Special Rod Ends

Modifications of standard or entirely special rod ends are available from Milwaukee at a slightly additional charge. When your requirements call for a special rod end style your order should include a sketch if it is to be an entirely special rod end or note reference as to which letter dimensions you wish to have modified (ref. pg. 2, 6-23 and 31).

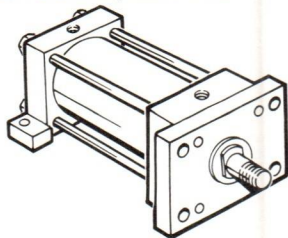
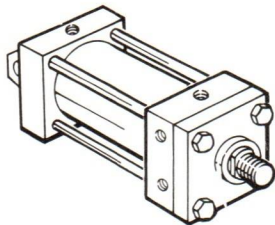
Special Assemblies From Standard Parts

This catalog was designed to aid in communication and simplify the placing of orders by our customers. On pages 2, 6-23 and 31 each style, of the various standard cylinder mountings, is illustrated using the commonly recognized cylinder dimensional symbols of the National Fluid Power Association. Each side of the end views are numbered to aid in communication when referring to the relationship between the ports and the mountings. When requesting information or placing an order, that requires a dimension other than standard, always make reference to the given dimensional symbol in the catalog and then give your requirements.

Combined Mountings

Standard mountings may be combined when specified by the customer. Some examples of this are:

1. An A31 mount constructed with an A42 mount blind end cap.



2. An A61 mount constructed with an A41 mount rod end cap.

These and other combinations can be readily made from standard parts. If you are unsure of a possible combination or if it will suit your particular needs consult your local Milwaukee representative or contact the factory.

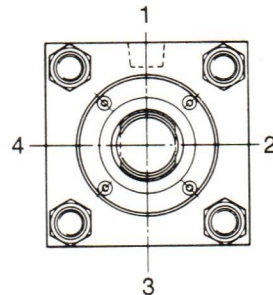
Cushion Adjustment Locations

A ball check is supplied as standard in position #4 and a cushion adjustment needle is supplied as standard in position #2 on most models. The cushion needle and ball check are interchangeable as far as location and may be put in any side not occupied by a port or mounting.

Design options

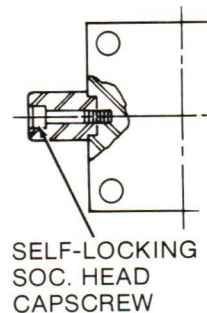
Port Locations

Ports are located in position #1 as standard unless otherwise specified by the customer. By using the position numbers given with the end views in the dimensional data section (pg. 6-pg. 23) of this catalog, ports can be arranged in anyone of four 90 degree positions in relation to the cylinder mounting without charge. When ports are relocated on a cushioned cylinder the cushion needle and ball check are automatically relocated to hold their relationship to the port as on a standard cylinder unless otherwise specified at the time of the order.



Removable Trunnion Pins

If specified by the customer removable trunnion pins are available on models A71 & A72 at a slightly additional cost. It is possible to have this type of trunnion pin on all bore and rod combinations, except on the largest oversize rod offered with each bore size on all model A71 cylinders.



Single Acting Cylinders

The Milwaukee Series "A" cylinders are designed for either single or double action. When used as a single acting cylinder, hydraulic power drives the piston in one direction only relying on either the load or an external force to return the piston after the pressure is exhausted.

Single Acting-spring Cylinders

Single acting spring return cylinders normally have a spring inside of the cylinder to return the piston to its original position. The application load and friction conditions must be specified when placing an order to properly size the spring. Also specify whether the spring is to return or advance the piston. A spring return cylinder is designed with a stop tube to act as a spring guide which prevents binding of the cylinder, due to mis-alignment of the spring. To accurately determine the cylinder length and mounting dimensions for your application contact your local Milwaukee Representative or the factory.

Water Service Cylinders

Milwaukee Series "A" cylinders can be used with water as an operating fluid with some standard modifications to the types of material and the manufacturing processes used. These modifications will include, at some additional cost, an aluminum piston nickel plated end caps, a brass cylinder barrel, and a chrome plated piston rod or stainless steel piston rod. Due to the increased factors of corrosion, electrolysis, and mineral deposits acting within a water fitted cylinder, Milwaukee cannot warrant or make any guarantees other than a water service cylinder will be free of defects in workmanship or materials.

PORTS

Standard Ports

The Milwaukee Series A cylinders are manufactured as standard, with NPTF tapered pipe thread ports of the largest size that will fit in both the rod and blind ends of a given bore size. Upon request extra ports can be provided on the sides of the end caps not occupied by mountings or cushion adjusters.

Oversize Ports

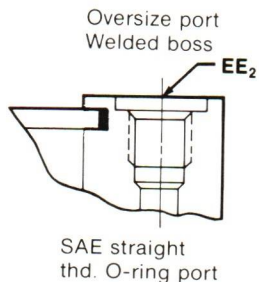
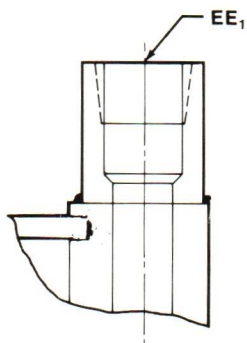
On most bore sizes, welded bosses may be provided for oversize NPTF ports. These bosses protrude from the sides of the end caps. For information as to the boss height, in relation to your bore and port requirements, contact your local Milwaukee Representative. Also special end caps can be provided, at additional cost, which are heavier so that oversize ports can be accommodated without the use of a welded boss.

Straight Thread Ports

On request Milwaukee will furnish an S.A.E. straight thread O-ring port with its Series A cylinders. In addition to the standard oversize NPTF ports welded bosses may also be used for oversize S.A.E. straight thread O-ring ports. For further information on oversize S.A.E. ports contact the factory.

Note:

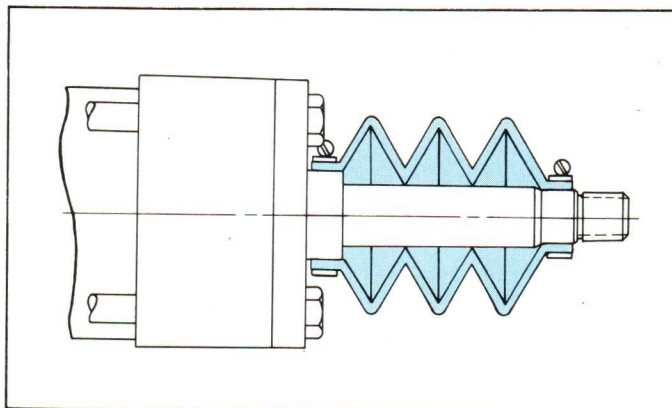
Flange and manifold style ports are available from Milwaukee at a slightly additional charge.



BORE	STD. NPTF PORT EE	OVER-SIZE NPTF PORT EE ₁	SAE STRAIGHT O-RING PORT	
			EE ₂	SAE STR. THD. SERIES
1½	⅜	½	# 6	9/16-18
2	⅜	½	# 6	9/16-18
2½	⅜	½	# 6	9/16-18
3¼	½	¾	#10	7/8-14
4	½	¾	#10	7/8-14
5	½	¾	#10	7/8-14
6	¾	1	#12	1½-12
8	¾	1	#12	1½-12
10	1	1¼	#16	1½-12
12	1	1¼	#16	1½-12
14	1¼	1½	#20	1½-12
16	1¼	1½	#20	1½-12

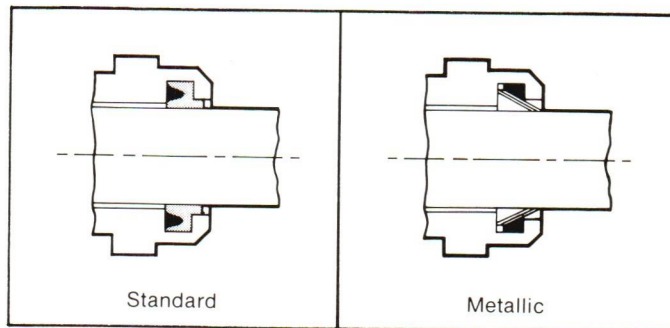
Rod Boots

When cylinders are used in areas of high contamination or where contaminants have an air hardening property the exposed piston rod should be covered with a rod boot to protect the rod bearing and seals. A rod boot is simply a collapsible cover used for such an application. It is of sewn construction made from a neoprene coated fabric. The rod boots are impervious to oil, grease, and water. They will operate effectively from 0 degrees F to +200 degrees F without cracking.



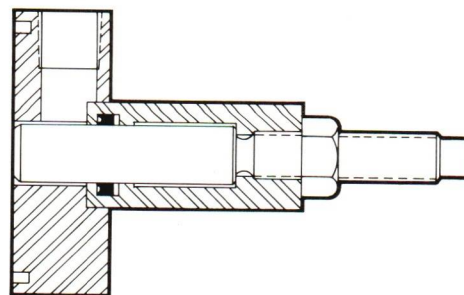
Metallic Rod Wipers

Metallic rod wipers will be supplied in place of the standard synthetic rubber wiper when specified at the time of order. This type of seal is recommended for applications where contaminants would tend to cling to the rod and damage a standard synthetic rubber rod wiper.



Adjustable Stroke Cylinders

When a cylinder application requires stroke adjustment Milwaukee offers a number of designs. This particular design is externally adjustable incorporating a threaded rod (of piston rod quality) with a seal nut. This provides a proven-effective low pressure seal affording maximum sealing on the stroke adjustment rod.



Further information concerning design limitations, cushioning, or alternate designs can be obtained by contacting the factory.

Stop Tube

Stop tubes are used to maintain bearing pressure within acceptable limits and are recommended on cylinders with long strokes or poorly guided rods.

The stop tube is a spacer between the rod end cap and the piston, which provides separation between the piston and the rod bearing. This separation reduces the moment forces developed between the rod bearing and the piston when the rod is extended.

Depending on the type of air cylinder you require "Milwaukee" offers two stop tube designs. When an air cylinder, cushioned on the rod end, requires stop tube an additional piston and spacer is used (refer to fig. B). If an air cylinder requiring stop tube is not cushioned only a spacer is used (refer to fig. A).

To determine if stop tube is necessary for your cylinder requirements you have to solve for "K" (refer to table 4). If the cylinder you require has a "K" dimension in excess of 40", stop tube is required. For each 10" increment or fraction of 10", in excess of 40", one inch of stop tube is recommended. When stop tube is required the overall length of the cylinder will be increased by the length of the stop tube to be used.

To Determine "K" (refer to table #4)

*note: W = the rod stick out (refer to pages 9 thru 27)

Cylinder #1, #4, #8 - from Table 4

$$K = 4L = 4 (\text{stroke} + W^*)$$

Cylinder #2 - from Table 4

$$K = L = (CA \text{ or } CE) + XG + \text{Stroke}$$

note: CA = rod eye dimension page 31

CE = rod clevis dimension page 31

XG = Mounting dimension page 19 or 21

Cylinder #3 - from Table 4

$$K = L = W^* + \text{Stroke}$$

Cylinder #5 - from Table 4

$$K = L = (CA \text{ or } CE) + XC + (2 \times \text{Stroke})$$

note: CA = rod eye dimension page 31

CE = rod clevis dimension page 31

XC = Mounting dimension page 19 or 21

Cylinder #6 - from Table 4

$$K = L = (CA \text{ or } CE) + XJ + (2 \times \text{Stroke})$$

note: CA = rod eye dimension page 31

CE = rod clevis dimension page 31

XJ = Mounting dimension page 19 or 21

Cylinder #7 - from Table 4

$$K = L/2 = (W^* + \text{Stroke})/2$$

NOTE: Stop tube length must be added to "K" factor before making final selection of rod size. This is primarily true in No. 5 long stroke applications.

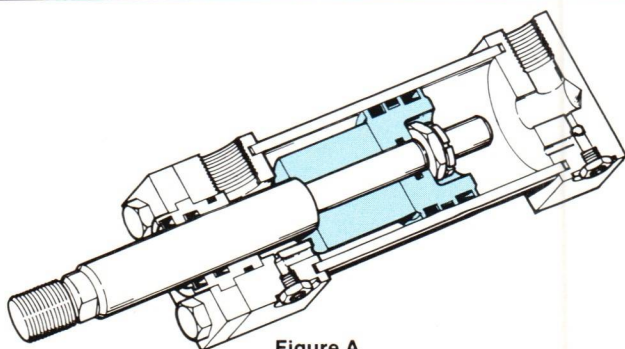


Figure A

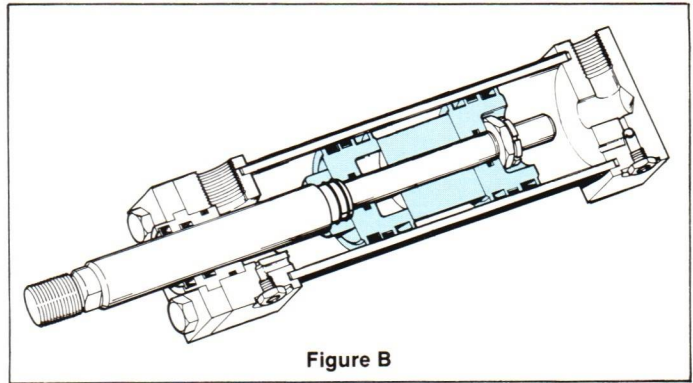
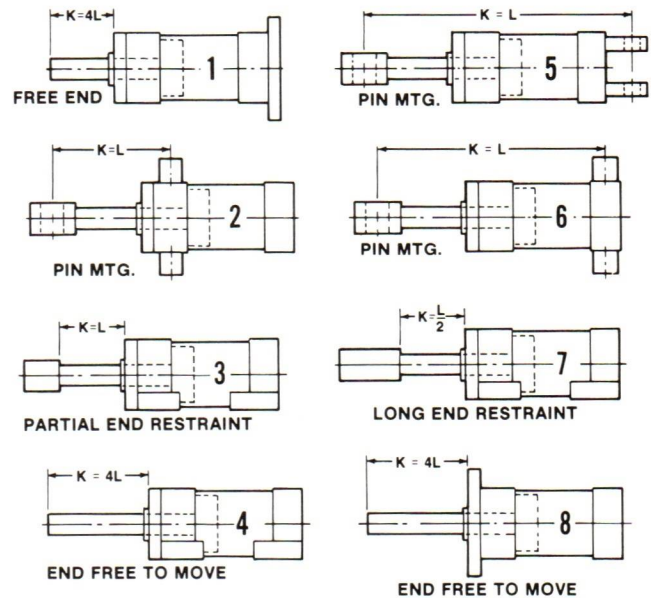


Figure B

**STROKE TO MOUNTING RELATIONSHIP
TABLE 4 — ALL RODS IN EXTENDED POSITION**



When mounting long stroke cylinders care should be taken to assure cylinder alignment over the entire length of stroke. The use of external guides or swivel bushings is recommended to reduce side load conditions and prolong the cylinders service life.

THRUST FORCE In. Lbs.	TABLE 5 — VALUE OF "K" IN INCHES												
	PISTON ROD DIAMETER												
	5/8"	1"	1 1/8"	1 1/4"	2"	2 1/2"	3"	3 1/2"	4"	4 1/2"	5"	5 1/2"	7"
400	35	84	134										
700	30	68	119										
1,000	26	60	105	156	190								
1,400	24	54	93	144	175	244	308						
1,800	23	48	84	127	160	230	294	366					
2,400	18	45	75	114	145	214	281	347					
3,200	16	40	68	103	131	196	262	329	398				
4,000	12	38	63	93	119	174	240	310	373	446			
5,000	9	36	60	87	112	163	225	289	359	426			
6,000		30	56	82	102	152	209	274	342	411	476		
8,000		25	51	76	93	136	186	244	310	375	448		
10,000		21	45	70	89	125	172	221	279	349	412		
12,000		17	41	64	85	117	155	210	270	326	388	455	
16,000			35	57	75	110	141	188	233	291	350	421	
20,000			28	52	66	103	136	173	218	270	325	385	
30,000				39	56	87	120	156	190	232	285	330	
40,000					24	43	75	108	142	177	210	248	293

Engineering Data

Rod Size Selection

"Milwaukee" Air Cylinders incorporate a high strength, surface hardened rod. Standard rod sizes are generally suitable for most applications, however, on long stroke or high thrust applications, the selection of minimum rod size should be checked using the following steps:

1. Knowing bore size, stroke, and push thrust (refer to Table No. 7 below), determine the overall length between mounting points, Table 1, pages 6-23. Equate determined overall length to "L".
2. Select from Table 2, pages 6-23, the type mounting being used and determine the equivalent length dimension "K". (Refer to page 26.)
3. Refer to Table 5, page 26 and using thrust load and developed "K" dimension, select rod size.
4. If oversize rod is required, re-check overall length dimension as determined in step No. 1. There will be a slight change which generally will not affect the "Size Determination" calculations, but must be considered in the cylinder installation.

TABLE 6 — DEDUCTIONS FOR PULL STROKE FORCE AND DISPLACEMENT

Rod Dia.	Area	CYLINDER FORCE IN POUNDS FOR VARIOUS PRESSURES								DISPLACEMENT Per Inch of Stroke	
		30	50	80	100	125	150	200	250	Pressure Air Cu. Ft.	Free Air 80 P.S.I. Cu. Ft.
$\frac{5}{8}$.307	9	15	25	31	38	46	62	77	.00018	.00116
1	.785	23	39	63	79	98	118	158	197	.00045	.00290
$1\frac{3}{8}$	1.485	44	74	119	149	186	223	298	372	.00086	.00554
$1\frac{3}{4}$	2.405	72	120	192	241	300	261	482	601	.00139	.00895
2	3.142	94	157	251	314	392	471	628	785	.00182	.01172
$2\frac{1}{2}$	4.909	147	245	393	491	613	736	982	1227	.00284	.01829
3	7.069	212	353	566	707	883	1060	1414	1767	.00409	.02635
$3\frac{1}{2}$	9.621	288	481	770	962	1202	1443	1924	2405	.00557	.03588
4	12.566	377	628	1006	1257	1571	1885	2514	3142	.00727	.04683
$4\frac{1}{2}$	15.904	477	795	1272	1590	1987	2385	3180	3975	.00920	.05926
5	19.635	589	982	1571	1964	2455	2946	3928	4910	.01137	.07324
$5\frac{1}{2}$	23.758	712	1188	1901	2376	2970	3564	4752	5940	.01375	.08857

NOTE:

To determine cylinder pull stroke force or displacement, deduct force or displacement corresponding to rod size in Table 6 from force or displacement corresponding to bore size shown in Table 7.

TABLE 7 — THRUST FORCE AND DISPLACEMENT

Bore Dia.	Area	CYLINDER THRUST FORCE IN POUNDS FOR VARIOUS PRESSURES								DISPLACEMENT Per Inch of Stroke	
		30	50	80	100	125	150	200	250	Pressure Air Cu. Ft.	Free Air 80 P.S.I. Cu. Ft.
$1\frac{1}{2}$	1.77	53	88	141	177	221	265	354	442	.00102	.00657
2	3.14	94	157	251	314	392	471	628	785	.00182	.01185
$2\frac{1}{2}$	4.91	147	245	393	491	613	736	982	1227	.00284	.01829
$3\frac{1}{4}$	8.30	249	332	664	830	1037	1245	1660	2075	.00480	.03091
4	12.57	377	628	1006	1257	1571	1885	2514	3142	.00727	.04682
5	19.64	589	982	1571	1964	2455	2946	3928	4910	.01137	.07324
6	28.27	848	1413	2262	2827	3533	4240	5654	7067	.01636	.10538
8	50.27	1508	2513	4022	5027	6283	7540	10054	12567	.02909	.18740
10	78.54	2356	3927	6283	7854	9817	11781	15708	19635	.04545	.29279
12	113.1	3393	5655	9048	11310	14137	16965	22620	28275	.06545	.42160
14	153.9	4617	7695	12312	15390	19237	23085	30780	38475	.08906	.57367
16	201.1	6030	10050	16080	20100	25125	30150	40200	50250	.11620	.74900

Installation and Maintenance Notes

STORAGE

Often times cylinders are delivered before a customer is prepared to install them and must be stored for a period of time. When storage is required the following procedure should be employed:

1. Select an area indoors for storage, which has a dry and non-corrosive atmosphere. Take caution to protect the cylinder from both internal and external corrosion.
2. Cylinders to be stored should be kept in a verticle position (piston rod up) whenever possible.
3. Port protector plugs should be kept in the cylinder ports until the time of installation.

INSTALLATION

General Information

1. Cleanliness—the most important consideration when installing the cylinder. When cylinders are shipped from Milwaukee the ports are securely plugged with plastic plugs, which should not be removed until the piping is to be installed. All piping should be thoroughly clean to include the removal of all threading and flaring burrs or chips before making the connection to the cylinder ports. One chip can cause premature failure of the cylinder or other hydraulic system components.
2. Alignment. Improper alignment will result in excessive cylinder wear. Check to assure rod alignment between the cylinder and its mating component on your machine in both the extended and retracted positions.
3. Environment. Cylinders operating in areas where there is weld splatter, fast drying chemicals, paint, excessive heat or other hazardous conditions, should have covers or shields to prevent damage to the rod and rod seals.

Mounting Recommendations

1. Foot Mounted Cylinders.
The use of high strength alloy steel mounting bolts 1/16" smaller than the hole size is recommended. After final alignment foot mounted cylinders should be dowel pinned in place.
2. Trunnion Mounted Cylinders.
Lubricated pillow blocks, designed for close tolerance applications should be used. It is important to rigidly mount and align the pillow blocks so that the trunnion pins will not be subjected to any extreme bending moments. The rod end should be pivoted with the pivot pin in line and parallel to the axis of the trunnion pins.
3. Flush Mount Cylinders.
The use of high strength alloy steel mounting bolts is recommended. Shear keys should be used to reduce the stress on the mounting bolts created by the normal push and pull forces created by the cylinder cycle.
4. Flange Mount Cylinders.
The controlled diameter rod bushing extension can be used as a pilot to locate the flange mount. Dowel pins should be used after the cylinder is mounted and aligned to prevent shifting.
5. Clevis Mount Cylinders.
This type of cylinder must be pivoted at both ends and the pins must be in line and parallel to each other. After the cylinder is mounted the customer should check to assure that the cylinder is free to swing through its working arc without interference from other machined parts.

CYLINDER TROUBLE SHOOTING

1. External leakage —
If leakage occurs between the end cap and barrel check the tie rod torque. If the torque is correct then replace the barrel seal. When leakage occurs in the rod bushing area the rod seals should be replaced. If leakage continues or reoccurs in short period of operation check items 2 thru 5.
2. Cylinder misalignment —
Side load is a common problem which occurs when the cylinder application does not allow the piston rod to work in line during the extend and retract motions of the cylinder. Evidence of this is excessive seal failure, bushing wear, or galling of the piston rod. Often bending of the piston rod or complete failure (breakage) of the rod occurs.
3. Contamination on the piston rod —
Dirt and other material is often picked up when the piston rod is extended. When the rod is retracted in an excessively dirty application it often carries the dirt back into the rod seal cavity of the cylinder causing damage to the seals. With a

slight modification of the cylinder rod end, a rod boot can be added to protect the rod bushing and seals for most applications.

4. Bad mountings —
Due to wear of pivot pins or mounting bolts working loose a cylinder may have side load even though the rod was in line when the cylinder was first installed. All cylinder mountings should be checked periodically.
5. Damaged piston rod —
An extended piston rod can be damaged by the impact of a hard object which could burr the rod. If this occurs the rod should be checked immediately to prevent seal damage.
6. Internal leakage —
Inside the cylinder leakage past the piston seals can cause sluggish movement or settling of the cylinder under load conditions. This occurs due to leakage of worn piston seals or rings.
7. Creeping cylinder —
When a cylinder is stopped in midstroke and it creeps check for internal leakage. Creeping can also be caused by a worn control valve and this should be checked even if the cylinder is found to have internal leakage.

CYLINDER MAINTENANCE

Rod Seal Replacement

When changing rod seals extend the piston rod 3" or more if possible being sure to support the rod at all times. Remove the retainer plate screws (if tie rod nuts have to be removed refer to the nut torque specification on this page when re-assembling the cylinder), retainer plate and outer bushing. Using an eye hook or thin screwdriver pry the vees from the end cap cavity (if low pressure air is applied to the rod end port this will help to force the vees from the cavity). The new set of vees should be assembled into the cavity separately and lubed with the soft vee in the center. Replace the rod wiper in the bushing and reassemble the cylinder.

Piston Seal Replacement

When changing piston seals extend the piston rod 3" or more, if possible, being sure to support the piston rod and the piston at all times. *Remove the tie rod nuts, blind end cap, the barrel and then the piston seals. A light grease, compatible with the system fluid, should be used on the rings and block vee seals for smooth assembly. Install the block vee piston seals, scarf cutting only the back-up washers. Then install the wear ring. To reassemble start the piston into the tube. When the piston block vee seal is to the edge of the barrel, use a thin rounded blade to start the lip of the block vee, making sure the entire lip is started before moving the piston further into the tube.

*Note:

When a cylinder has been disassembled this far the barrel seals should at least be inspected if not replaced.

Barrel Seal Replacement

When replacing barrel seals use the same method of disassembling the cylinder as used when replacing piston seals. The barrel seal is a gasket which is layed into the end cap tube groove first. Then position the end caps squarely on the tube (check to make sure port location is correct) and firmly force or tap the end cap over the tube until it bottoms. Check to make sure the gasket did not move and then finish assembling the cylinder.

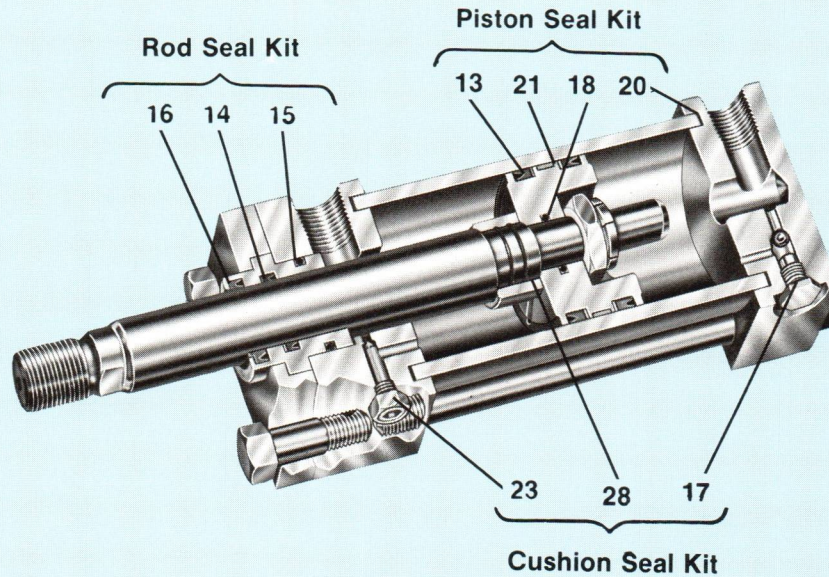
Nut Torque Specifications

When it is necessary to remove the tie rod nuts on a cylinder they must be reassembled to the torque specification given below. To prevent the tie rods from twisting when tightened use a vice grips or locking clamp. Note that the torque specification is based on lubricated threads.

NUT TORQUE SPECIFICATIONS

Cylinder Bore	1½	2-2½	3¼-4	5-6	8	10-12	14-16
TORQUE FT. LBS.	5	12	30	50	100	160	250

Seal Kits



How to Order Complete Seal Kits

When ordering complete seal kits specify the following information on your order:

1. The serial number of the cylinder the seals will be used on.
2. The bore and rod size.
3. If the cylinder is cushioned.

To eliminate untimely delays in the handling of your order please use the seal kit code as shown in the example below:

Example:

Buna-N Kit No. XXXXX-0-40
-cylinder code number
(refer to page 6-23)

Viton Kit No. XXXXX-1-40
-cylinder code number
(refer to page 6-23)

How to Order Partial Seal Kits

Refer to the picture above to determine which partial seal kit you require and then select the appropriate kit number from the

tables below. Standard Series "A" Air cylinders contain Buna-N seals. Viton seals are used in applications where temperatures are in excess of +250 degrees F.

STD. ROD DIA.	ROD SEAL KIT	
	BUNA-N	VITON
5/8	00011-0-41	00011-1-41
1	00012-0-41	00012-1-41
1 1/8	00112-0-41	00112-1-41
1 1/4	00123-0-41	00123-1-41
2	00133-0-41	00133-1-41
2 1/2	00144-0-41	00144-1-41
3	00155-0-41	00155-1-41
3 1/2	00156-0-41	00156-1-41
4	00166-0-41	00166-1-41
4 1/2	00187-0-41	00187-1-41
5	00188-0-41	00188-1-41
5 1/2	00189-0-41	00189-1-41

BORE SIZE	PISTON SEAL KIT	
	BUNA-N	VITON
*1 1/2	00011-0-43	00011-1-43
1 1/2	00011-0-42	00011-1-42
*2	00110-0-43	00110-1-43
2	00110-0-42	00110-1-42
*2 1/2	00120-0-43	00120-1-43
2 1/2	00120-0-42	00120-1-42
3 1/4	00130-0-42	00130-1-42
4	00140-0-42	00140-1-42
5	01X50-0-42	01X50-1-42
6	00160-0-42	00160-1-42
8	00180-0-42	00180-1-42
10	01100-0-42	01100-1-42
12	01120-0-42	01120-1-42
14	01140-0-42	01140-1-42

*Cushioned cylinders with 5/8" rod diameter.

BORE SIZE	ROD SIZE	CUSHION SEAL KIT	
		BUNA-N	VITON
1 1/2 THRU 2 1/2	5/8	00011-0-51	00011-1-51
	1	00012-0-51	00012-1-51
	1 1/8	00112-0-51	00112-1-51
	1 1/4	00123-0-51	00123-1-51
3 1/4 THRU 5	1	00130-0-51	00130-1-51
	1 1/8	00131-0-51	00131-1-51
	1 1/4	00132-0-51	00132-1-51
	2	00133-0-51	00133-1-51
	2 1/2	00144-0-51	00144-1-51
	3	00155-0-51	00155-1-51
	3 1/2	00156-0-51	00156-1-51
6 THRU 14	1 1/8	00160-0-51	00160-1-51
	1 1/4	00161-0-51	00161-1-51
	2	00162-0-51	00162-1-51
	2 1/2	00163-0-51	00163-1-51
	3	00164-0-51	00164-1-51
	3 1/2	00165-0-51	00165-1-51
	4	00166-0-51	00166-1-51
	4 1/2	00187-0-51	00187-1-51
	5	00188-0-51	00188-1-51
	5 1/2	00189-0-51	00189-1-51

How to Order

Series "A" Cylinders

Standard Series "A" Cylinders can be completely and accurately described by a model number consisting of coded symbols. If your requirements are completely standard, select the symbols from page 31 that represent your cylinder and place them in the sequence indicated by the example. Use of the cylinder code will eliminate untimely delays in handling your order. Be sure to include with your order, all of the information requested in the applications data area.

General Order Data (Covered by the cylinder code)

1. Bore & Rod size or the cylinder code: (refer to page 6-23)
2. Mounting Style: (refer to page 6-23)
3. Rod End Style: (refer to page 2)
4. Cushion Requirements
5. Length of Stroke

Note: Duplicate cylinders can be ordered by giving the serial number from the nameplate of the original cylinder. Factory records supply a quick, positive identification.

Replacement Seals or Cylinder Parts

For replacement seals or cylinder parts, the serial number of your cylinder, the cylinder code number and the item number of the part you require (page 31) should appear on your order. To order entire seal kits for your cylinder refer to page 29.

Applications Data

1. Port Requirements: refer to page 21.
2. Operating Medium: Series "A" cylinders are equipped with seals for use with shop air or petroleum base fluids. Specify on your order if any other type of operating medium is to be used.
3. Temperature Range: Series "A" air cylinders contain seals of Nitrile (Buna-N) suitable to -30 degrees F to +250 degrees F. Specify your operating temperature if your application does not fall within this temperature range.
4. Operating Pressure: Series "A" cylinders are rated for 250 PSI. If your requirements are in excess of the rated pressure describe your application in your order.
5. Accessories: Specify any accessories you require using the part numbers given on page 31.
6. Special Requirements: If you require special seals, rod material, stop tube, center support, adjustable stroke, or any other special requirements not covered, specify in detail on your order.

Retainer Plate Capscrew Torques

Retainer Plate
Capscrew Torques
All Rod Sizes —
Models A21 and A31

BORE	TORQUE (LBS-FT.)
1 1/2	5
2	12
2 1/2	12
3 1/4	30
4	30
5	50
6	50
8 thru 16	30

Retainer Plate Capscrew Torques
Models A22, A32, A61 and A73

BORE	ROD	TORQUE (LBS-FT.)
1 1/2	5/8	6
2	5/8	6
	1	15
2 1/2	5/8	6
	1	15
	1 3/8	15
3 1/4	1	15
	1 3/8	15
	1 3/4	15
4	1	15
	1 3/8	15
	1 3/4	15
	2	15
5	1	15
	1 3/8	15
	1 3/4	15
	2	15
	2 1/2	27
	3	27
6	1 3/8	15
	1 3/4	15
	2	15
	2 1/2	27
	3	27
	3 1/2	27
	4	27
8 thru 16	All	30

WARRANTY

Seller warrants the goods sold hereunder to be free from defects in material and workmanship for a period of twelve months after date of shipment from Seller's plant. If the goods are in accordance with or in reference to an engineering drawing specified by or furnished to the customer, the specifications and information on the drawing shall be applicable in determining such correct use, operation and application.

When claiming a breach of the above warranty, Buyers must notify Sellers promptly in writing whereupon Seller will either examine the goods at their site, or issue shipping instructions for return to Seller.

When any goods sold hereunder are proved not as warranted, Seller's sole obligation under this warranty shall be to repair or replace the goods, not including installation

or any other charges, at its option, without charge to Buyer.

THIS WARRANTY COMPRISES SELLER'S SOLE AND ENTIRE WARRANTY OBLIGATION AND LIABILITY TO BUYER, IT'S CUSTOMERS AND ASSIGNS IN CONNECTION WITH GOODS SOLD HEREUNDER. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS ARE EXPRESSLY EXCLUDED.

CONSEQUENTIAL DAMAGES: In no event shall Seller be liable for consequential or special damages arising out of a delay in or failure of delivery, defects in material or workmanship, or arising out of a breach by Seller of any other term or obligation of Seller under this contract.

Cylinder Force and Speed

Air Cylinder Force

When calculating cylinder force on the return (pull) stroke, remember that the rod area must be deducted from the piston area. When a double rod end cylinder is used, deduct for both directions of stroke when calculating the thrust force.

Air Cylinder Speed

The exact speed of an air cylinder cannot be calculated. Air cylinder sizing depends on the degree of overpowering required to move the load at the desired speed, valving, piping, and other factors which usually are unknown and cannot be measured.

When a fast speed is required, the bore size and line pressure should be twice that which is needed to balance the load resistance. The lines to the valve and cylinder should be as short as possible. When selecting the directional valve to be used in an air application, the orifice of the valve should be equal to the cylinder port size. The air cylinder speed chart shows the proper port size under average conditions.

Note: The following Air Cylinder Speed Chart is based on average conditions. Conditions where the cylinder is operating at twice the thrust force required and a line pressure of 80 to 100 psi.

AIR CYLINDER SPEED								
Actual Valve Orifice Size								
Bore	1/32	1/16	1/8	1/4	3/8	1/2	3/4	1
1 1/8	5	12	28	85				
1 1/2	3	7	16	50	125			
2	1	4	9	28	70	112		
2 1/2		2	6	18	45	72	155	
3 1/4			3	9	22	36	78	165
4			2	7	17	28	60	130
5			1	4	11	18	40	82
6				3	7	12	26	55
8				1	4	7	15	32
10					2	4	9	20
12					1	3	6	14

Above Figures are in Inches Per Second

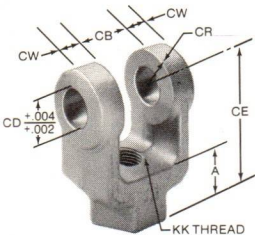
Dimensional data

CAUTION

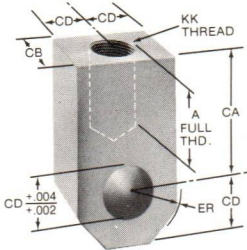
The accessories are rated for load capacities equal to the standard load capacity of the related cylinder bores given on this page only when standard rod sizes are used. For special applications information consult with your local Milwaukee representative or contact the factory.

Note:

The rod clevis and rod eyes are designed for use with the standard "Milwaukee" style No. 2 rod end. When ordering these accessories be sure to match the thread size of the style No. 2 rod end of the rod size you ordered to the thread size of the accessory you require.

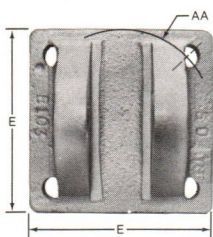
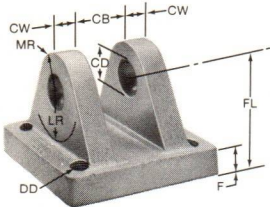


ROD CLEVIS

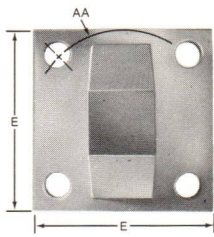
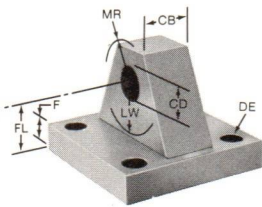


ROD EYE

ROD CLEVIS		ROD EYE		MAX. LOAD (TENSION) POUNDS	THD. SIZE	A	CA	CB	CD	CE	CR	CW	ER
PART NO.	CODE	PART NO.	CODE		KK								
15-72-1001	C101	15-73-1001	C301	4380	7/16-20	3/4	1 1/2	3/4	1/2	1 1/2	1/2	1/2	9/16
15-72-1002	C102	15-73-1002	C302	12372	3/4-16	1 1/8	2 1/16	1 1/4	3/4	2 3/8	3/4	5/8	15/16
15-72-1003	C103	15-73-1003	C303	20433	1-14	1 5/8	2 13/16	1 1/2	1	3 3/8	1	3/4	1 1/8
15-72-1004	C104	15-73-1004	C304	30483	1 1/4-12	2	3 7/16	2	1 3/8	4 1/8	1 3/8	1	1 9/16
15-72-1005	C105	15-73-1005	C305	49479	1 1/2-12	2 1/4	4	2 1/2	1 3/4	4 1/2	1 3/4	1 1/4	1 7/8
15-72-1006	C106	15-73-1006	C306	70095	1 7/8-12	3	5	2 1/2	2	5 1/2	2	1 1/4	2



CLEVIS BRACKET



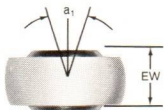
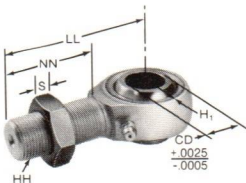
EYE BRACKET

CLEVIS BRACKET		EYE BRACKET		MAX. LOAD (TENSION) POUNDS	THD. SIZE				DE	E	F	FL	LR	LW	MR
PART NO.	CODE	PART NO.	CODE		AA	CB	CD	CW							
15-74-2001	B101	15-75-2001	B401	7510	2.3	3/4	1/2	1/2	3/8-24	13/32	2 1/2	3/8	1 1/8	13/16	1 1/16
15-74-2003	B102	15-75-2003	B402	20082	3.6	1 1/4	3/4	5/8	1/2-20	17/32	3 1/2	5/8	1 7/8	1 5/16	1 1/8
15-74-2004	B103	15-75-2004	B403	27684	4.6	1 1/2	1	3/4	5/8-18	2 1/32	4 1/2	3/4	2 1/4	1 3/8	1 1/4
15-74-2005	B104	15-75-2005	B404	20685	5.4	2	1 3/8	1	5/8-18	2 1/32	5	7/8	3	1 7/8	1 3/8
15-74-2006	B105	15-75-2006	B405	31556	7.0	2 1/2	1 3/4	1 1/4	7/8-14	29/32	6 1/2	7/8	3 3/8	2	2
15-74-2007	B106	15-75-2007	B406	35381	8.1	2 1/2	2	1 1/4	1-14	1 1/32	7 1/2	1	3 1/2	2 1/16	2 1/16

PIVOT PIN				
PART NO.	CODE	CD	CL	P
15-76-1001	P101	1/2	1 1/8	9/64
15-76-1002	P102	3/4	2 5/8	9/64
15-76-1003	P103	1	3 3/8	13/64
15-76-1004	P104	1 3/8	4 1/8	13/64
15-76-1005	P105	1 3/4	5 1/8	13/64
15-76-1006	P106	2	5 1/8	17/64

PIVOT PIN

- 1) Pivot pins are furnished with clevis mounted (A-61) cylinders as standard.
- 2) Pivot pins for 1 1/2" 16" bore are furnished with cotter pins.
- 3) Pivot pins are not furnished as standard and must be ordered separately for use with accessories.

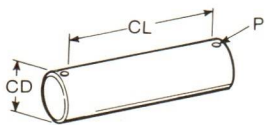


SPHERICAL ROD EYE

Note:

The spherical rod eye is used with Style 3 and 5 rod ends.

PART NO.	MAX. LOAD (TENSION) POUNDS	SPHERICAL ROD EYE							
		a1	CD	EW	H1	HH	LL	NN	S
S-301	1450	12°	1/2	5/8	1 1/16	7/16-20	27/16	1 15/32	1/4
S-302	2880	13 1/2°	3/4	7/8	29/32	3/4-16	227/32	1 23/32	7/16
S-303	10885	14°	1	1 3/8	1 13/32	1-14	43/32	2 3/32	9/16



Cylinder Order Code — Model Number

FEATURE	DESCRIPTION	PAGE NO.	CODE NO.	EXAMPLE
DOUBLE ROD END		22	D	
CYLINDER CODE	REFER TABLE 1	9,11,13 15 & 17	—	
MOUNTING STYLE	MODEL NUMBER ONLY	8,10,12 14 & 16	—	
ROD END STYLE	CODE NUMBER	2	—	
CUSHIONS	NONE ROD END BLIND END BOTH ENDS	— — — —	1 2 3 4	
CYLINDER MODIFICATIONS	SPECIAL		S	
SEALS	BUNA (-30° TO 250° F) VITON (-15° TO 350° F) SPECIAL		1 2 S	
STROKE	SPECIFY IN INCHES INCLUDING FRACTIONAL REQUIREMENTS		—	

***NOTE:**
USE "S" IF ANY SPECIAL DESIGN FEATURES OR SEALS ARE REQUIRED. DESCRIBE IN DETAIL ON YOUR ORDER.

EXAMPLE: THE CODE FOR AN AIR CYLINDER
4" BORE, 2" ROD, STYLE NO. 1 ROD END,
CUSHION BOTH ENDS STANDARD SEALS WITH
A 14 3/4" STROKE IS 143-31-14-1 x 14 3/4"

Standard Parts List

Standard Parts List		ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
		1	PISTON ROD	16	ROD WIPER
		2	CYLINDER BARREL	17	"O" RING SEAL FOR BALL CHECK RETAINER
		3	HEAD END CAP	18	"O" RING SEAL FOR PISTON
		4	CAP END CAP	19	N/A
		5	ROD BUSHING	20	GASKET
		6	RETAINER PLATE	21	PISTON WEAR RING
		7	PISTON	22	TIE ROD NUT
		8	CUSHION PLUNGER	23	TEFLON RING SEAL FOR CUSHION ADJ. NEEDLE
		9	CUSHION ADJ. NEEDLE	24	PISTON NUT
		10	BALL CHECK RETAINER	25	JAM NUT FOR CUSHION ADJ. NEEDLE
		11	BALL CHECK	26	TIE ROD
		12	N/A	27	NYLOCK CAP SCREW
		13	PACKING AND BACKUP WASHER FOR PISTON	28	O-RING FOR FLOATING CUSHION
		14	ROD SEAL AND BACKUP WASHER		
		15	O-RING SEAL FOR ROD BUSHING		

Your Economy is in Our Quality

milwaukee
Cylinder
a versa tek company

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